FLYING AND POPULAR AVIATION

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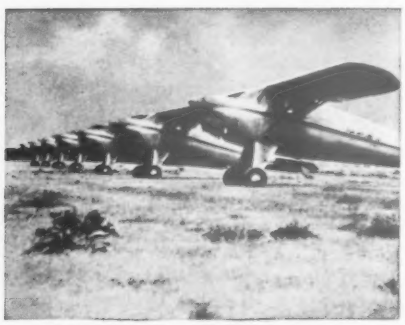

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and in such jobs as these that lead to executive positions.

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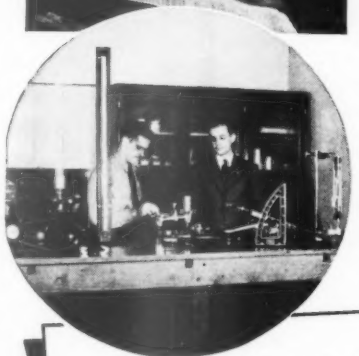
Parachute Rigger
Airway Propeller Mechanic
Instrument Mechanic
Radio Mechanic
Airport Machinist

This Chart Gives You a Clear Picture of Your Many Opportunities as a Parks' Graduate in

Commercial Aviation!



Do you think of the aviation industry *only* in terms of flying and mechanical skills?

Then study the chart above carefully. It shows you many varied phases of commercial aviation. Each is a position in which there are Parks graduates today—happy for their selection of training that enabled them to advance to leadership in the *business* of aviation.

You can see from the experience of these Parks graduates the value to you of training that is specialized yet comprehensive in its field; training that is so practical it will open aviation's doors to you and at the same time provide you with the fundamental principles that are essential for advancement.

Leadership Training

Parks Air College was founded 14 years ago to provide just this type of training for the personnel of the aviation industry. In point of recognition Parks is the oldest aviation school in the U. S. with the original approval of the Department of Commerce, dating back to 1927, and now holds C. A. B. Certificate No. 1 as an Advanced Flying School. Because of its high standards and the thoroughness of its training courses, Parks has long been recognized by the aviation industry as a leader in this field.

The opportunities in this business of aviation are many—but your success depends upon the type and thoroughness of your training. That's why it means a great deal to you to be a Parks graduate.

Parks offers you a college education with *specialized*, yet comprehensive, training in each of the following four courses: Professional Flight and Executive, Aviation Operations and Executive, Maintenance Engineering and Aeronautical Engineering. Parks 64 page catalog describes these courses in detail—it will pay you to send for it today.

PARKS AIR COLLEGE . . . East St. Louis, Illinois

PARKS AIR COLLEGE was founded August 1, 1927.

Has enjoyed full Federal approval longer than any other aviation school.

Is accredited in its Aeronautical Engineering School by the Illinois Superintendent of Public Instruction.

Is accredited by the United States Office of Education of the Federal Security Agency.

Graduates are qualified educationally for appointment as flying cadets in the U. S. Army Air Corps and for flight training in the U. S. Naval Air Reserve.

Has a capacity enrollment of 300 commercial aviation students, 216 U. S. Army Air Corps flying cadets and 48 enlisted mechanics.

Has its own airport with a school plant of 25 buildings devoted to school purposes entirely, also two fields of 568 acres and 96 acres for military flight training.

Has a faculty of 82, each especially qualified for his particular field of instruction.

PARKS AIR COLLEGE Section PA-2
East St. Louis, Illinois

Please send me details of four major courses in commercial aviation training.

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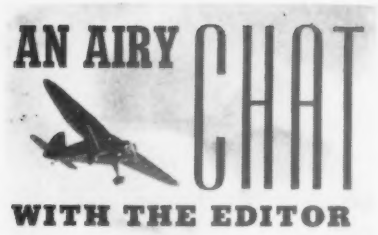

WHAT'S to be done with this tremendous American aviation industry once the war has ended? With U. S. aircraft manufacturing facilities already expanded to phenomenal proportions—and further expansion under way—our aviation industry suddenly has zoomed from an extremely modest role in world affairs to the head of the world's armament parade. . . . But no one will want thousands of giant bombers or deadly fighters after the war. Billion-dollar aircraft factories will be faced with shutting down. Thousands of skilled workmen will glut the already glutted ranks of the unemployed; millions of dollars worth of precision machinery will be auctioned—*unless*.

Unless U. S. civil aviation does what we expect it to. We look for private and commercial flying to climb to unheard-of heights immediately after this war. Then, manufacturers will turn to the only thing left for them: the air-minded man-on-the-street. The private plane market soon will be resplendent with the most ingenious and attractive ships that engineers can devise. Many thousands of these—we would call them the new-fangled "safety" planes today—will make airport traffic regulation more of a profession than ever. This will be offset somewhat by the fact that these new planes *safely* will be able to land and take off from any sizeable pasture, lawn, beach or even highway, despite the fact that most of them will be flown by amateurs. Major highways will have roadside facilities where these ships can land alongside gas stations. These planes will carry at least three people with all the comfort of a modern automobile. They will have tricycle landing gear so that the average person will be able to land the family plane almost anywhere, despite winds or rough terrain. There will be slots, flaps, coupled control systems, giant shock absorbers—everything known to aeronautical engineering that will make a flying machine as safe as any means of transportation possibly could be. Throttles will be on the floor, with the familiar hand-setting gadget on the dashboard. The brake pedal will be in the same spot it is on your car. There will be built-in air conditioning units; radios will be practically universal. These airplanes will be in the same price class as the deluxe automobile. . . . Accidents? Yes, there are bound to be—but they will be caused by persons flying into trees or houses or other planes; there will be no more stall, spin or nose-over. Engine failure will be even more of a rarity than it is today.

(*Continued on page 85*)

FLYING AND POPULAR AVIATION

Trade-mark Registered

Volume XXVIII Number 2

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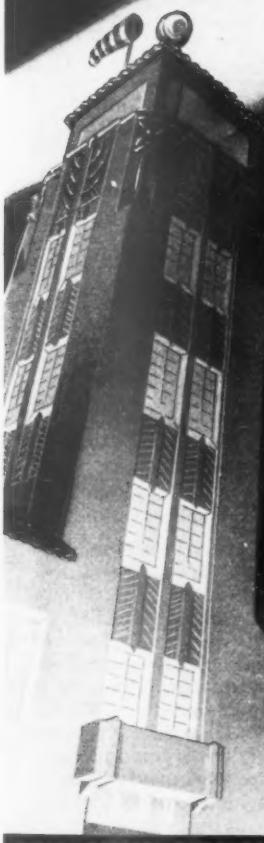

IN THE VERY CENTER AND A VERY IMPORTANT PART OF SOUTHERN CALIFORNIA'S GREAT AIRCRAFT INDUSTRY IS LOCATED CURTISS-WRIGHT TECHNICAL INSTITUTE

Established in 1929, in twelve years this famous school has come to be recognized as the nation's leading institution in the training of Aeronautical Engineers and Master Mechanics. Mr. Donald Douglas, President of the great Douglas Aircraft Company, chose this school for his own son's training which pointedly indicates the high standing this school has attained in the aircraft industry.

You, who plan to invest in a course of career training, to prepare yourself for the future, must determine in advance what the returns will be on your investment before you put cash on the line. This is imperative since your choice of a school in which to take your training will determine how much money you will make all the rest of your life. Your whole future in aviation depends on your training.

Curtiss-Wright Tech's career training is carefully designed to do just one thing:—TO MAKE MORE MONEY FOR YOU so upon graduation you can be independent and self-supporting for life. For years our hundreds of successful graduates have proven that Curtiss-Wright Tech training gets results and always pays. It has provided them with a profitable occupation and secure future since it trained them in advance for the highest position they could ever expect to occupy. It can do the same for you.

Aviation needs trained men. They are in demand and at a premium. Advancements for them are rapid, especially here in Southern California where there are over $234,000,000.00 in unfilled aircraft orders on hand and where over fifty per cent of all aircraft manufactured in the United States is made. You can get in on the ground floor by training now. BUT you must choose the right school for your training.

Our graduates are obtaining immediate employment and the demand for them far exceeds the supply. We honestly believe that every student who enrolls here will be able to obtain, with our assistance, immediate employment upon graduation. This school has never guaranteed or promised positions for its graduates, but practically every graduate has obtained immediate employment, and is advancing steadily.

WARNING!—"don't miss the boat." The greatest opportunity of your lifetime exists today! There never was such an opportunity in aviation for you; there may never be another. A position awaits you. Insure for yourself a steady income and independence for life. Send in your enrollment today before you "miss the boat."

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THIS TRAINING *places*

Never before has the demand for trained pilots been so urgent as it is today. Airline expansion is actually being retarded because of the acute shortage of competently trained pilots. Flight instructors are in demand everywhere. Because of California Flyers' modern fleet and proven training it is absolutely impossible for us to supply the requests for graduate pilots.

In aviation the Master Mechanic is the man responsible for the production, operation and maintenance of the world's great air fleets. At California Flyers the Master Mechanic student receives the practical training that prepares him for a position with airlines and aircraft plants. And it is this training that assures him immediate employment and rapid advancement.

Because the Aeronautical Engineering student at California Flyers trains in the center of modern aviation in America, in the city where half of the Nation's planes are engineered he learns the latest not only in design and engineering but in modern plant procedure. Because of this advanced training the California Flyers graduate's services are in demand everywhere.

and WE CAN'T SUPPLY THE

Yes, you're that close to a position in aviation! Four months to 24 months from the day you enroll at California Flyers, depending on the course, you will be ready for a position in aviation, a position unparalleled in opportunity. And what is more important, a position is waiting for you for ***it is impossible for California Flyers to supply the demand for its graduates.***

Why does California Flyers put you in aviation faster? Here is the answer. From the day you enroll at California Flyers you are *in* aviation, preparing to do your share in the Defense Program. No time is wasted in unrelated, academic subjects. What you get is thorough, practical, industry training geared to the needs of the aviation industry and geared to the needs of our National Defense. What is more important, this training is specified training . . . specified by the industry to fulfill its needs.

California Flyers is not only located in the Nation's Aviation Capital but on the very airport that is the home of these famous aircraft plants.

California Flyers is one of the few schools in the country that recognizes the vital need for specialized training, the need not only for Aeronautical Engineers, but for Aircraft Draftsmen—not only for Master Mechanics, but for Production Mechanics and Instrument Technicians—not only for Airline Pilots, but for Commercial Pilots and Flight Instructors. So it is that California Flyers gives you the opportunity of choosing a particular course that best suits your natural talents, and gives you the training which in a shorter space of time fits you for a career in the particular branch of your chosen field.

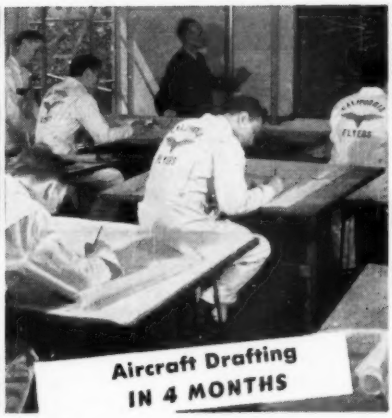
Why is there such an unprecedented demand for our graduates? An important reason is California Flyers' location in the very heart of aviation in America, on the same airport with the plants of North American, Douglas-El Segundo and Interstate, on the very test field where the famous planes of Douglas, Lockheed, Northrop and Vultee have been tested and proved, in the city which is a terminus for United Airlines, Transcontinental and Western Air, American Airlines and Western Air Express. It is a school that is an integral part of this aviation picture. It is a school which through day to day personal contact works hand and hand with the industry, meeting the industry's personnel problems with men trained to its specifications. *Is it any wonder that this school cannot supply the demand for its graduates?*

California Flyers is not only approved by the United States Government for Flight and Master Mechanics Courses, selected by the Civil Aeronautics Authority for primary and advanced flight training, but it is one of the few schools chosen by the U. S. Army Air Corps to train its aviation mechanics. It is the school you, too, should choose.

CLIP THE COUPON ON OPPOSITE PAGE

YOU IN AVIATION in 4 to 24 months

The Production Mechanic is the Aircraft builder. Because this is the largest field in aviation, the young man entering this branch has unlimited opportunities. At California Flyers the Production Mechanics student is trained to do not only one thing well, but all phases of production from metal forming to final assembly. It is this thorough training that takes him to the top.

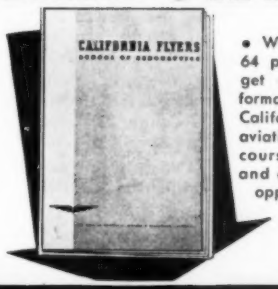


Throughout every stage of planning and production the Aircraft Draftsman is the right hand of the men responsible for the successful design and engineering of the airplane. The young man enrolling at California Flyers secures training that is clear, concise and easy to master. Because of this thorough practical training the graduate's opportunities are unlimited.

With the increased use of instruments the position of Instrument Technician has become of vital importance. At California Flyers the student trains in an active maintenance shop. It is this type of training that prepares him for the many opportunities in the Instrument field—a position in an aircraft plant, an airline, the Civil Service or he may operate his own business.

DEMAND FOR OUR GRADUATES

"I am a California Flyers Graduate." It means something to say that. It means that aviation wants you to the extent that over 96% of all California Flyers graduates are employed in the industry and there are consistently more requests for our graduates than we can supply. It is a passport into aviation. It means also that you are a man marked to succeed like the California Flyers men before you. And that is what *really* counts.



• Write for new 64 page catalog, get complete information on all of California Flyers' aviation training courses, tuition and employment opportunities.

Why does a California Flyers man stand so high? is obvious once you have heard the complete story of this famous school. Its founders believe that aviation should be taught in a school where the student remains an individual—learning aviation as it pertains to his individual ambitions and qualifications, and by so doing he is prepared for the responsibilities of leadership. This trains the graduate to meet today's aviation problems and to contribute to tomorrow's aviation advancement. This is the way today's leaders learned. Only this way can a training program be built for the industry, on industry specifications. They believe too that the entire field of aeronautics—engineering, mechanics and piloting are all closely interwoven and that a student should train in a school that teaches all of these important divisions. Above all, they believe that aviation should be taught in an environment of aviation activity, taught where there is the greatest number of men actively engaged in aviation. This is why California Flyers is located in the heart of the world's aviation capital on the world's busiest testing field.

If this is the kind of school you would like... friendly, efficient, modern and thorough, an aeronautical school operated by practical aviation men, you will be most interested in reading the *complete* story of California Flyers in the new 64 page catalog.

CALIFORNIA FLYERS, INC.

SCHOOL OF AERONAUTICS

LOS ANGELES MUNICIPAL AIRPORT, INGLEWOOD, CALIFORNIA

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Aeronautical Engineering ☐ *Airline Piloting* ☐
Production Mechanics (Aircraft sheet metal) ☐ *Aircraft Drafting* ☐
Instrument and Radio Beam Flying ☐ *Master Mechanics* ☐
Instrument Technician ☐

Name_____ Age_____

Address_____

City_____ State_____

The Birdmen's Perch

This month we inaugurate a new feature—the Funnyboner's Dept. We'd like to hear about the boners you pulled when you were learning to fly. I think we'll get some pretty good laughs, and of course, there's nothing like profiting by the other fellow's mistakes!

Major Al Williams, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

FUNNYBONER, NUMBER 1

Here is the first boner I pulled while learning to fly:

I had just soloed and had logged a few hours solo time, when I took the trainer up for a half hour practicing turns and figure eights. When my half hour was up, I glided back to the airport and prepared to land. I checked the wind sock as usual, but this day I must have been thinking of something else, for I started to land *down* wind. The plane was an old two-seater, open-cockpit plane and landed rather hot. My approach was good, but as I leveled off to set her down, I noticed the hangars and school office were flashing by at rather a high rate of speed. I kept pulling back on the stick trying to set her down, but I kept using more and more of the runway. I noticed the last hangar at the end of the runway flash past, and I gunned her to come around again. As I did, I noticed another plane preparing to land in the opposite direction to which I was attempting to land.

All of a sudden it dawned on me that I had landed *down* wind instead of *into* the wind.

Clifford Smith, Forest Hills, L. I.

IS THERE A CARPENTER IN THE HOUSE?

Two amateur pilots were building a hangar for their plane. They had been saving money for a long time to build this hangar, and they had just enough lumber on hand—and no more.

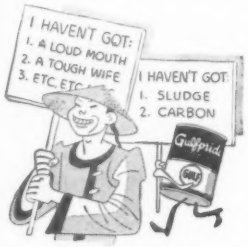
Unfortunately, one of the pilots, while working, sawed a ten-foot beam of 3" x 5" in half by mistake. He now had two

five-foot lengths and the plans called for a ten-foot beam. To complete the hangar, they had to splice the two five-foot lengths together. And remember—aside from nails, they could spare nothing, neither hardware nor wood. If you had been there, how would you have helped those two fellows splice those two pieces together?

Send in your answer, *with* illustrations.

THE CHINESE HAVE THE RIGHT IDEA

Here in this country, we usually judge a man by what he has: 300 hours in the air, a million dollars, or a set of twins. In China, on the other hand, a person is judged by what he hasn't. Bad habits, a loud mouth, or a shrewish wife, for instance.



Now, if you really want to appreciate Gulfpride Oil to the fullest, you've got to take the Chinese point of view. Gulfpride is important to you because of what it *hasn't!*

Gulfpride Oil *hasn't* a lot of things which might lead to inefficient lubrication in your motor, because we've gone to a lot of trouble to see that these things were taken out!

To be specific, we've started with only the finest crudes. Because, while we know it's possible to make a fair oil out of poor crude, we know that only the finest crude will give you the *best* oil.

Also, that's why we use the Alchlor process—experience has shown us that this special process removes up to 20% more of the carbon and sludge formers! It all boils down to this: because we've taken the trouble to see that Gulfpride has a lot of important "*hasn'ts*"—you've got one of the finest, toughest, longest-lasting oils you could put into a motor!

THIS MONTH'S WHOPPER

Dear T.W.T.:

I am the only man alive, who holds the solution to a problem which has baffled science for years.

I shall explain to you why Halley's comet is not a comet, but is none other than my uncle, Pookie Googins.

Uncle Pookie was the greatest safe cracker of all time. Admired by all in that profes-

sion. Safe manufacturers spent thousands of dollars inventing new safes just to baffle Uncle Pookie. But he always found a way to spoil their efforts. Finally, they built a safe that was fire-proof, torch-proof, bomb-proof, and crack-proof. But that didn't stop Uncle Pookie, no sir!

He had heard of the wonderful things G. A. G. was doing, so he proceeded to the nearest airport and obtained a small bottle of this amazing gas.

He poured a little of the G. A. G. in the cracks around the safe door, calmly stood back, and flicked a lighted match at it.

Well sir, right then and there Uncle Pookie discovered the meaning of the saying "Crime doesn't pay."

You can yank my prop, if that safe didn't make a noise like a cross between a thunderbolt and a gang of women at a fire sale. With a tremendous howl, it left the floor and took Pookie at the belt buckle.

There he stuck as she zoomed for the stratosphere.

The last time he passed the earth, I noticed he and the safe were taking on a teardrop shape. I figure he will come around again in about forty years, and by that time I hope to invent a gun that will shoot a life line to him. I'm considering using G. A. G. instead of powder to fire it with.

Flipper Lewis

P.S. That ring around Saturn is a friend of mine who took off in a power glider with a tank full of G. A. G. and got his controls jammed in a left bank.

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

Let's Stand Off and Look at This Aviation Training from the Standpoint of FACTS

● Where and how you receive your aviation training is of the utmost importance. It is important that you get the FACTS about location and reputation of the school . . . training facilities and equipment . . . courses available . . . instructors . . . living conditions.

SPARTAN is more than willing to be compared with all other aviation schools from the standpoint of actual known FACTS. Because SPARTAN is recognized as one of the most modern and complete schools of its kind in equipment and training courses.

SPARTAN SCHOOL OF AERONAUTICS

● SPARTAN offers you the prestige of a famous aviation school fully approved by the U. S. Government for flight and mechanics training. It is located in the heart of the nation's greatest flying country. A $475,000 expansion program assures top rank training *plus* modern-to-the-minute advantages which lead to good jobs and advancement in aviation—11 new training planes—6 private practice fields—one of the most complete instrument repair, service and overhaul departments in the country with facilities for taking care of 84 airplanes currently in use in civilian and military fleets—24 modern buildings including four hangars, shops, laboratories, 14 classrooms—one of the most efficient new cafeterias in the Southwest—another new giant clublike dormitory to house an additional 180 men—an operating staff of 350 persons.

GET ALL THE FACTS about the advantages Spartan offers for the aviation career of your choice—Flight, Mechanics, Engineering, Radio, Instrument Technician.

Next Semester Starts April 1.

Mail This Coupon!

SPARTAN SCHOOL OF AERONAUTICS, Captain Maxwell W. Balfour, Director
Dept. PA 21, Tulsa, Oklahoma

Send me your new 1941 Catalog describing in detail the SPARTAN courses I have checked; also stating tuition and living expenses.

NAME ..... Age .....
Address .....
City ..... State .....
Previous Education ..... (11)

CHECK COURSES YOU PREFER

- ☐ Air Transport Pilot
- ☐ Airline Maintenance Engineering
- ☐ Aeronautical Engineering
- ☐ Instrument Technician
- ☐ Aircraft or Engine Mechanic
- ☐ Airline Service Mechanic
- ☐ Commercial Pilot
- ☐ Instructor Rating
- ☐ Instrument Rating
- ☐ Air Transport Radio Communications
- ☐ Aircraft Factory Mechanic

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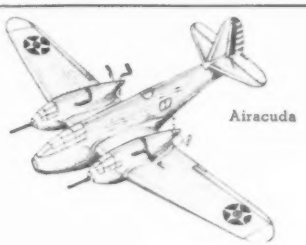

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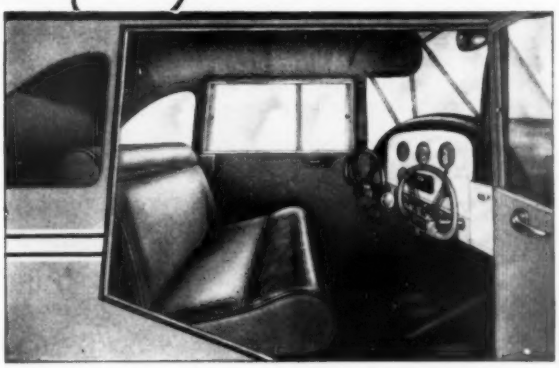

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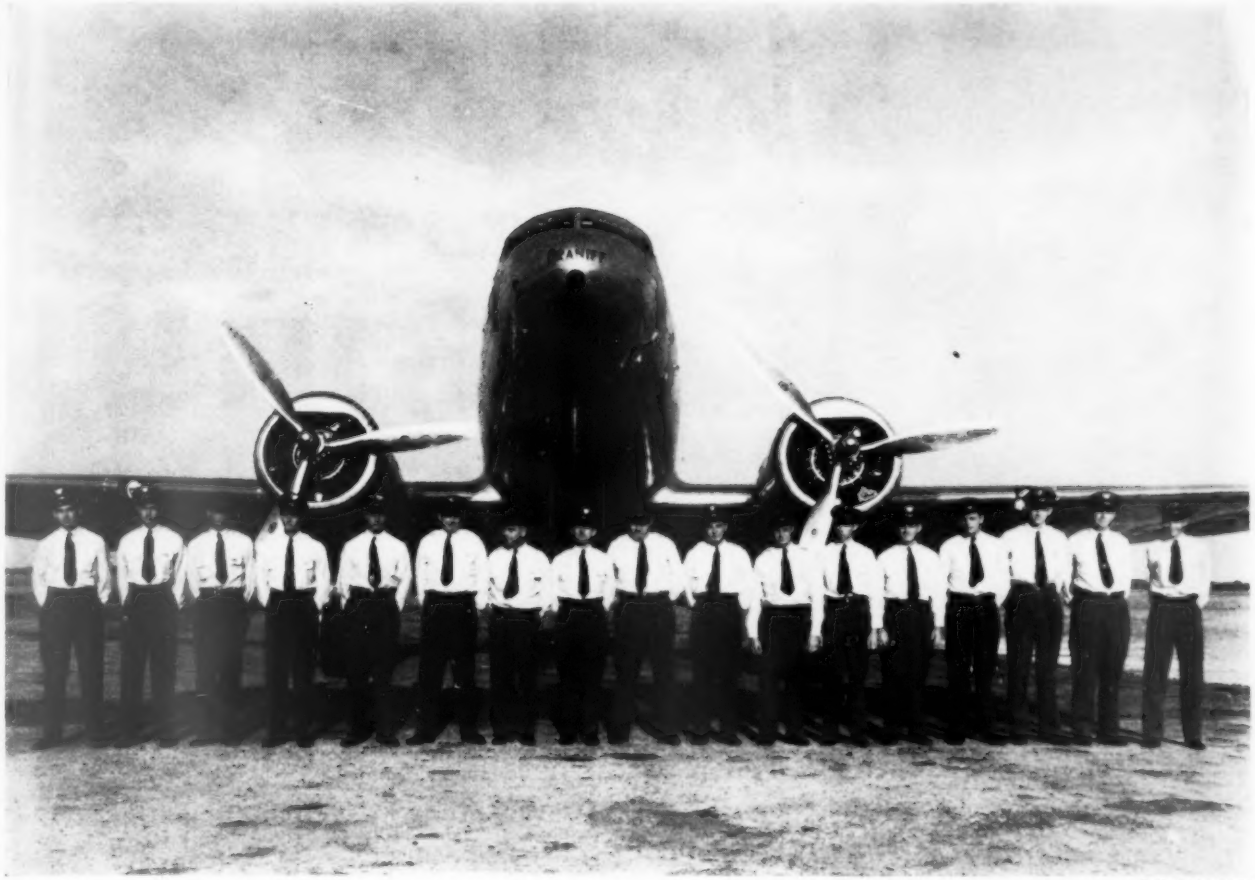

Polly Smith Photo

WANTED: AIRLINE PILOTS

When you pick up a newspaper and turn to the classified advertising section, the chances are you will never see a major airline advertising: WANTED: AIRLINE PILOTS.

The 17 pilots, shown above, were selected from the list of Dallas Aviation School graduates to become captains of a major airline because officials of this company have *confidence* in our school. Airlines advertise their schedules, safety and comfort of their lines, but when they need employees, they write or contact a well established aviation school whose graduates have *proved* their worth.

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New Eagles FOR THE ARMY

by LEONARD ENGEL

Hundreds of Bell P-39's are on order.

Standardization of basic warplane types keynotes the new procurement program of the Army Air Corps now getting under way.

THE United States is today in the process of building the greatest air armada in history. For the last 20 years, though the quality of its pilots and planes has been excellent, its numbers were few. The U. S. has lagged behind other world powers in military aviation. First Italy, then Russia, and most lately Germany and England have been the builders of mighty air fleets. But, with the outbreak of the war and the launching of our armament program, the situation has changed and the United States is getting under way.

Certain facts regarding the present U. S. Air Corps program are of a secret nature and hence may not be discussed in this article. However, from facts that have been made available to the public, it is possible to make a brief survey of the proposed line-up of the new planes of the Army Air Corps; of its expanding personnel and changing policy.

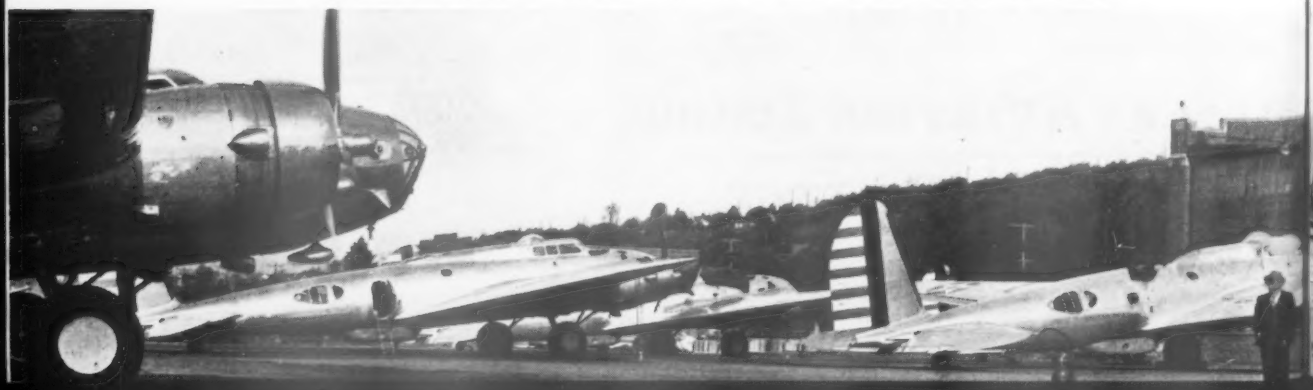
The new Army Air Corps is to be built around two types of heavy bombardment planes, three medium bombers, three light bombers, three pursuit types, and one pursuit-interceptor. With swarms of trainers and observation craft, its total strength will, in time, approach 25,000. If Navy planes are counted—as they must be—America's air force will surpass even that of the incredible Nazi *Luftwaffe*.

The Boeing *Flying Fortress*, Consolidated B-24, Martin B-26, North American B-25, Douglas A-20A, Douglas A-24 (SBD-3), Curtiss XSB2C-1 (Army designation not yet known), Bell P-39 *(Airacobra)*, Curtiss P-40 and P-46, Republic P-47 and Lockheed P-38—ships widely known as well as ships not so familiar, they're all there. All are on order, most by the hundreds. Production on all but a few is already under way. The total cost for planes and engines under this program comes to $1,500,000,000.

The geography of the United States—its tremendous size and far-flung borders—has dictated great range as a primary characteristic of its Air Corps bombers. American bombers must be capable of quick transfer from coast to coast. Speed was a secondary consideration for a time; it was expected that the most American planes would be called upon to face would be ship-based aircraft, which are not as fast as land-based types. Hence the development of such lumbering machines as the Douglas B-18. The B-18 and her somewhat more modern sister, the B-18A, are not very fast (220 m.p.h. top) but they can carry 4,400 pounds of bombs over a radius of nearly 1,000 miles.

In the new Air Corps the problem imposed by geography has been met in a somewhat different way because the European war has taught the increased importance of speed and the general advance in aeronautical science has made

Latest "Flying Fortresses" going to Army are Boeing B-17C's. B-17E will have redesigned tail for turret.



RUDY ARNOLD

Current standard fighter in the Air Corps is this Allison-powered Curtiss P-40. Several squadrons of these have replaced P-36A's. "Bottleneck" in production of P-40 is slow production of Allisons.

it possible to build speed and range into the same plane.

Extreme range, with adequate speed, are provided by the four-motored heavy bombardment craft. The heavy twin-engined type of familiar character (good range and load, but poor speed) is out. The need for greater speed is met in the medium series which is shorter-ranged and cannot carry the same load. One medium bomber, the Martin B-26, grosses nearly 13½ tons; the North American B-25 is the other and weighs about 11 tons fully loaded. The Douglas B-23 (13½ tons, *Twin Cyclones*, 295 m.p.h.) was an intermediate type along the line of development of the current medium bomber. Only 30 B-23's were built and no more have been ordered.

Air weapons of extreme mobility, capable of carrying out diving attacks, are provided in the light bomber class. The famous B-17 class will remain the backbone of the Air Corps' heavy-duty squadrons—but it will not be the *Flying Fortress* familiar today. The four-motored Boeing giant has undergone half a dozen major modifications in its four-year history. Going into production in January is the latest of the series, the B-17E, which will have a top speed approaching 300 m.p.h., a gross weight of 22 tons, a radius of action (distance of target a plane can reach, allowing for return to base; radius of action usually is about 45 per cent of maximum range) of 1,700 miles and bomb load, at shorter distances, of five tons. It will be the first *Flying Fortress* with power-driven turrets and heavy defensive armament which replace the single-gun blisters and sliding panels of earlier models. Installation of a rear turret necessitated complete redesign of the whole rear half of the fuselage. The new Boeing will also incorporate an exhaust-driven turbo-supercharger which will give the plane high performance at 25,000 feet and enable it to operate successfully just above 30,000.

The Air Corps already has about six squadrons of earlier *Flying Fortresses*, including the original B-17, the B-17B (the first production plane with a turbo-supercharger), and the B-17C. The "C" and "E" both are driven by the most powerful Wright *Cyclone* single-row engines, each rated at about 1,200 h.p.

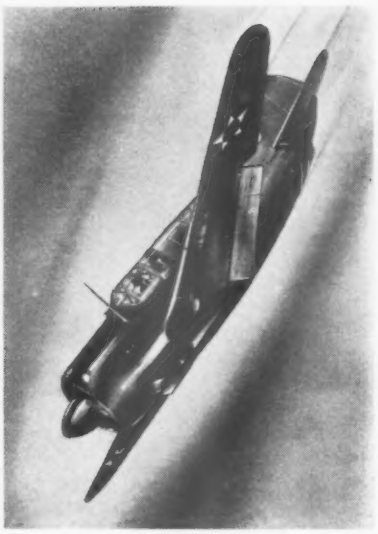
The B-24 is a little smaller and faster —310 m.p.h., full weight 20 tons, 1,500-mile radius, four-ton bomb load, tricycle landing gear, a high wing and four Pratt & Whitney 1,200 h.p. *Twin Wasps*. It, too, is power-turreted, the first Air Corps plane to be so equipped. This installation, as was to be expected of any new development, caused a little difficulty.

This Consolidated ship combines unusually low drag and easy handling with a high wing loading, something that is not found in every airplane and which is characteristic of the unorthodox Davis-Caltech thin section wing, around which the plane is built.

Both the Boeing and Consolidated, as well as other smaller bombers, will have

The Air Corps will get a military version of the Douglas SBD-3 dive bomber (Marines' model below).

Consolidated B-24 will be standard Air Corps heavy bomber, will have power turrets.



Plans also call for the Air Corps to get a military version of Navy Curtiss XSB2C-1.

One standard Army medium bomber will be the tricycle-geared North American B-25.

New stock fighters for the Air Corps will include the tricky, deadly Lockheed P-38.

Latest medium Army bomber is Martin B-26. Note four-bladed controllable propellers.

one feature not previously found in U. S. bombers—quarter-inch armor shielding the combat stations of every man aboard ship, with the probable exception of the luckless tail gunner. He is difficult to shield because the tail turret is so heavy that the additional weight of armor would make the plane unflyably tail-heavy.

The Air Corps has virtually no B-24's on hand as the first 26 are being turned over to the British.

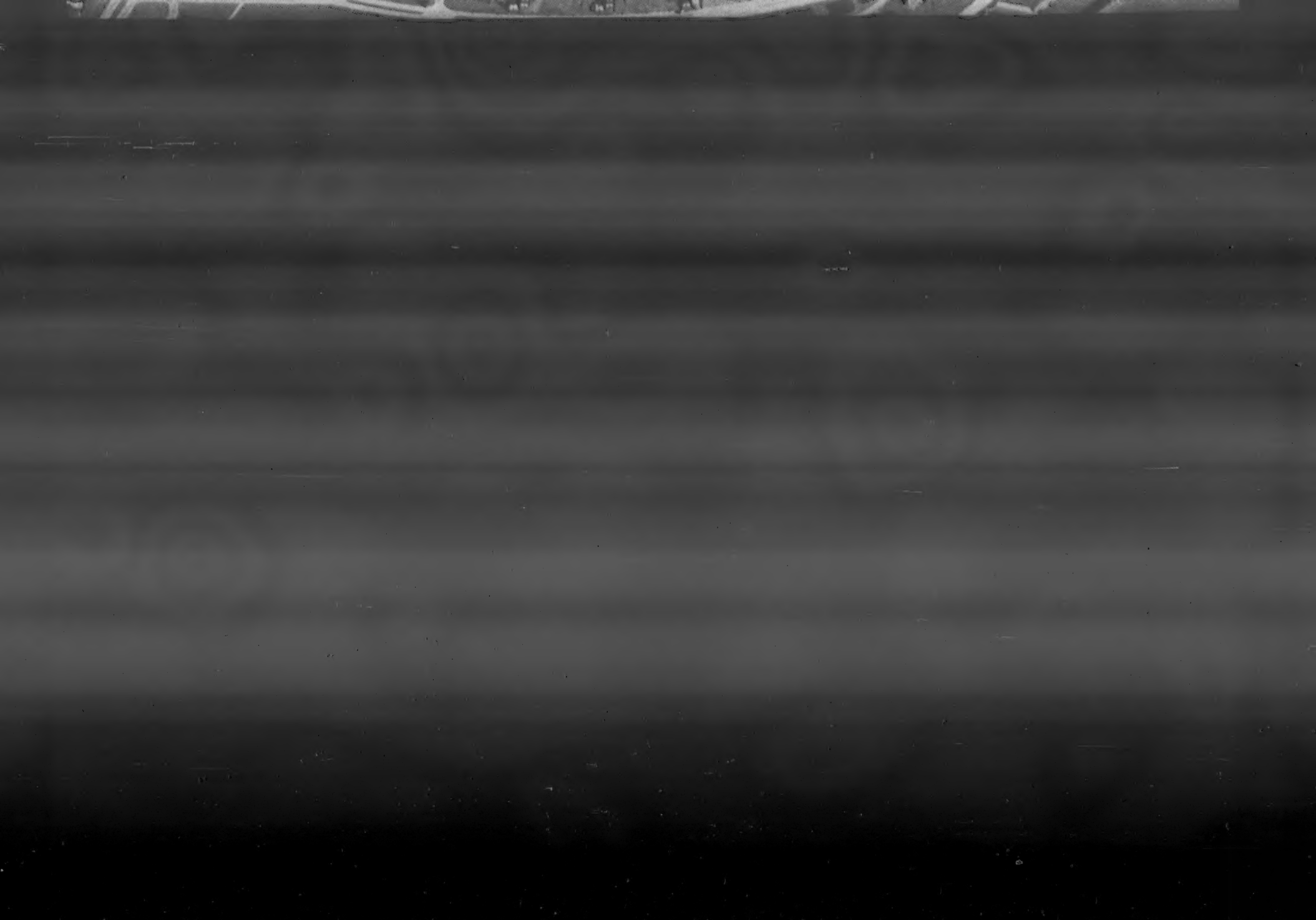
The Martin B-26, one of the medium bombers, has just reached the prototype flight-testing stage and information about it is, therefore, very much restricted. Suffice it to say that it is a semi-high-winged plane with a gross weight of 26,-625 pounds, two *Double Wasp* engines, four-bladed Curtiss propellers and a tricycle landing gear. Top speed: about 340 m.p.h. Maximum bomb load is believed to be about 3,000 pounds.

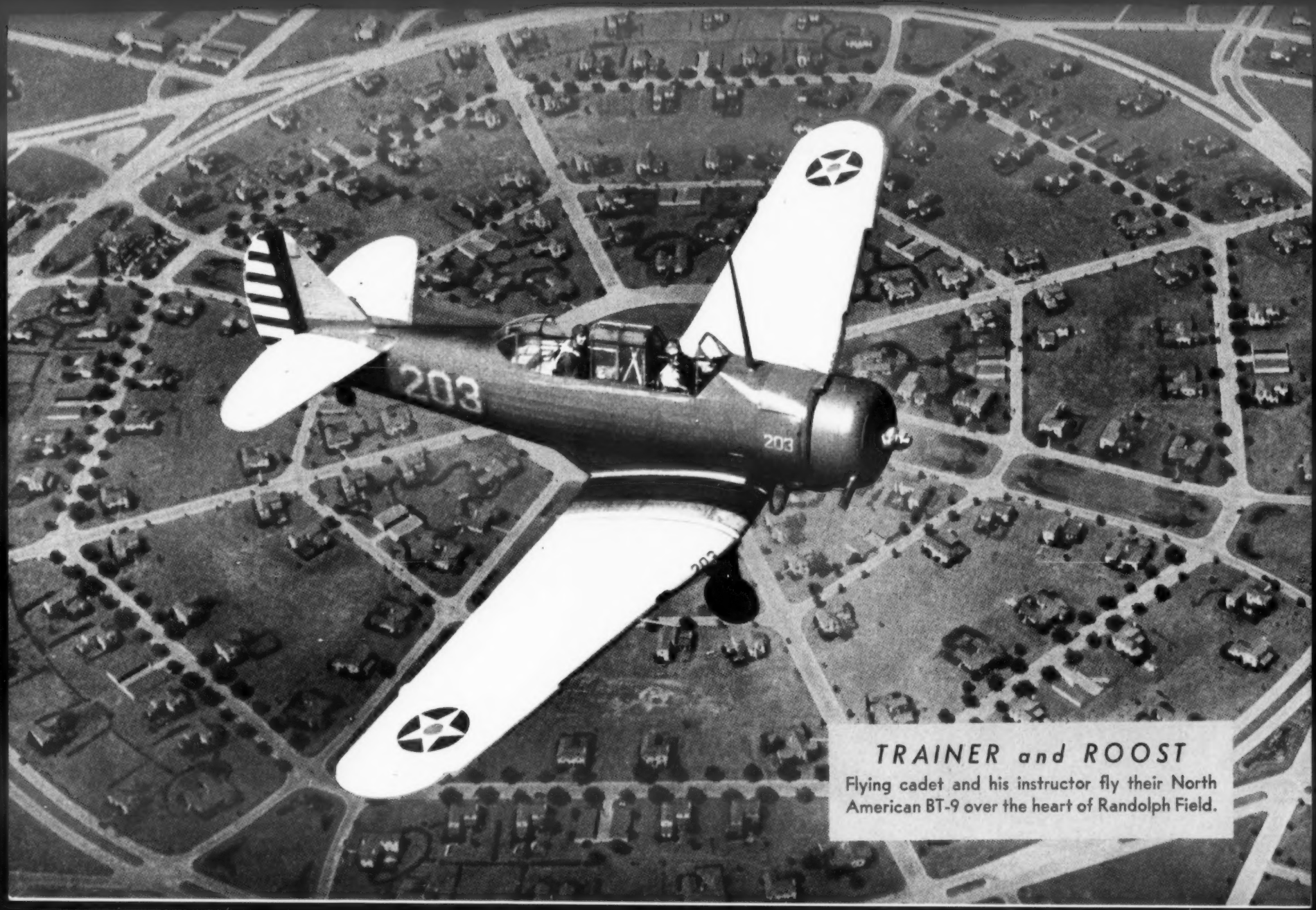
The best-known current Martin is the 167W, which was ordered originally by the French and is now being turned out in quantity for the English. The 167W is an eight-and-half-ton attack plane powered by *Twin Wasps* and should not be confused with the B-26. The B-26 is a completely new design.

The North American NA-40—the B-25—also is a medium bomber. It is a much modified version of the overgrown attack bomber North American first developed about two years ago. High-winged and tricycle-geared, its two *Twin Cyclones* drive it about 325 m.p.h. Medium bombers will all have power turrets.

The three ships in the light bomber class are one attack and two dive bombers. The Douglas A-20A is the attack ship and is a plane with a long history indeed. It is descended from the first DB-7, the plane which Douglas intended to submit in the Army's first attack-bomber competition two years ago. It crashed on a test flight over Los Angeles, killing Pilot Johnny Cable and injuring the famous

(*Continued on page 67*)





TRAINER and ROOST

Flying cadet and his instructor fly their North American BT-9 over the heart of Randolph Field.

GROENHOFF

I. Ae. S.

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Major Gardner (left), mainspring of the Institute, confers with C. E. Sinclair.

Institute reception room is at left. Models on table are German warplanes.

The society insignia.

by

E. JAY DOHERTY

The Institute of the Aeronautical Sciences is the only top-flight professional society in American aviation. Membership is 3,000.

Dr. J. C. Hunsaker

THERE'S a novel experiment going on at the Institute of the Aeronautical Sciences in New York, where the most complete private aeronautical library in the United States is housed. The Paul Kollsman Library of the Institute will mail aeronautical books for loan to any responsible person in the nation, on request.

It's a new departure in technical library procedure and a radical one. According to Maj. Lester D. Gardner, the Institute's executive vice president, other scientific bodies are anxious to learn whether or not this system will work. If it does, virtually all the technical literature in the country will be available any place any time for the price of a three-cent stamp.

Nucleus for the circulating library are the 2,000 books owned by the Institute before a gift of $50,000 was presented last June by Paul Kollsman and F. W. Magin, vice president and president respectively of the Square D Company. The gift has made possible extensive additions to the book collection and the establishment of facilities for lending books by mail.

Now all one has to do after establishing his reliability by providing the Paul Kollsman lending library with two excellent character references is to write and ask for any aeronautical book. If the library doesn't have it on the list, it will buy and mail it right out.

The Paul Kollsman Library is only one of three remarkable reference services maintained by the Institute. The Aeronautical Archives embrace in addition the Burden Library, containing over 10,000 aeronautical books, magazines, reports, pamphlets, photographs and clippings; and the Aeronautical Index, a compilation of some 2,000,000 references to technical and biographical data, subject bibliographies and biographical material files. The cards, clippings and digests fill 60 standard filing cabinets.

The index was compiled through four years of work by the WPA and probably is the most complete reference file of the sort in the country. It consists of 2,000 main headings, a biographical index kept up to date from the latest books, magazines and newspapers; chronologies giving the dates for countless events in aviation history, a digest of technical articles, company files, general subject files, a book title index covering all languages,

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Cards, clippings and digests in the Institute's Aeronautical Archives now fill 60 filing cabinets.

an author index, an "index of indexes," giving complete indices of aeronautical books; a photographic file and bibliographies of aeronautics.

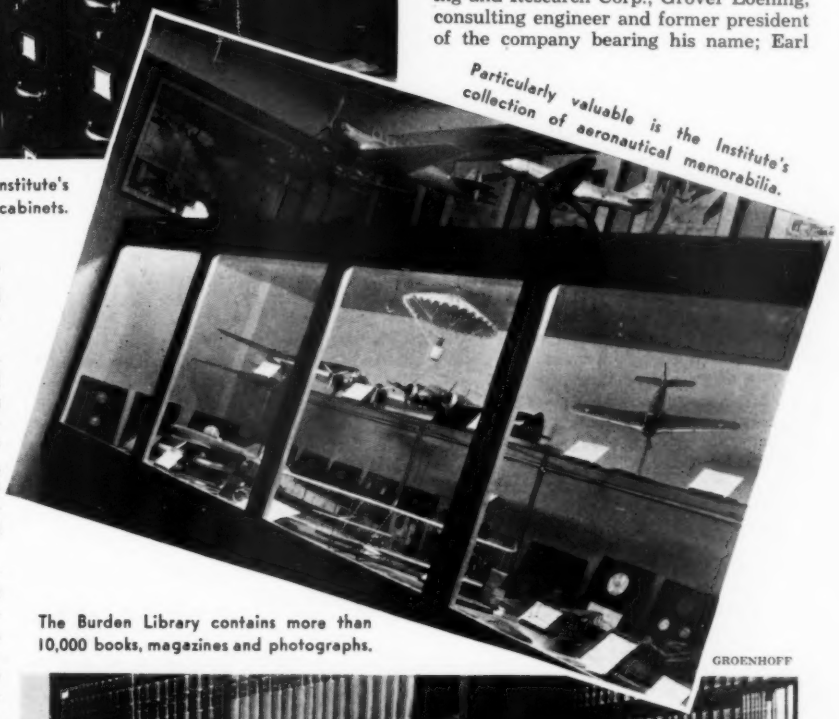
The value of such a collection to research workers in aviation, to writers and reporters, to engineers and scientists, is tremendous. The titles loaned the Institute by W. A. M. Burden fill out the library with a most complete selection. Burden also bought a collection of 50,000 clippings and presented them to the archives to be added to the biographical files.

All this fills four large rooms in the Institute's offices in Rockefeller Center. On the walls hang prints, plaques, photographs and mementoes of famous events. Airplane models rest on all available table and filing cabinet space. It would be impossible to mistake these offices for any others. The spirit of aviation greets you at the door and stays at your side until you leave. This is headquarters for the most accomplished men in aviation. The Institute's membership roster reads like Who's Who in Aeronautics.

Still a young organization in spite of its prominence, the Institute of the Aeronautical Sciences has more than a library and a blue ribbon roll call. It has, for instance, Lester Durand Gardner founder of the magazine "Aviation," one-time member of international aviation commissions, former commander of the aviation camp at Waco, Tex., and former member of the board of control of the department of military aeronautics. The Major's space in Who's Who in Science and Industry looks at first glance like a treatise on the cause and effects of the World War. He entered the Army as a private in 1915, rated a captaincy in the aviation section of the Signal Corps two years later and was discharged as a major on flying status in 1918.

As far back as 1928 Major Gardner was pondering the advisability of forming some sort of aeronautical society in the United States that would perform the same services as the famed Royal Aeronautical Society in England. But the real beginning of the Institute was over a pot of tea the major shared one day in September, 1932, with Dr. J. C. Hunsaker, head of the mechanical and aeronautical engineering departments of the Massachusetts Institute of Technology.

They discussed the type of organization they should have, the membership, the structure and the means of organizing and decided to call some aeronautical leaders together for lunch at the Yale Club on the 26th of that month. Present were Charles L. Lawrance, president and chief engineer of the Lawrance Engineering and Research Corp.; Grover Loening, consulting engineer and former president of the company bearing his name; Earl



Particularly valuable is the Institute's collection of aeronautical memorabilia.

The Burden Library contains more than 10,000 books, magazines and photographs.

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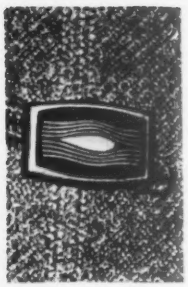


Members' lapel pin.

Osborn of the Edo Float Co., and Col. E. E. Aldrin, then consultant to the Standard Oil Company and a lieutenant - colonel in the Air Corps Reserve. As a result of their meeting a suggestion that such a society be formed was sent to 400 leaders in aeronautics. This group included aircraft operators, builders, engineers and scientists.

The response was immediate and unanimous and the Institute of the Aeronautical Sciences was incorporated in October, 1932. The name had been suggested by E. P. Warner, now with the C. A. A. For the first year it was purely a paper organization; there were no offices, no employes, no overhead expenses. Dues were set at $5 per year and the end of the first year found the Institute with a treasury of $1600. Only $400 had been spent for letters, secretarial work and other out-of-pocket expenses. Dr. Hunsaker was the first president, Major Gardner, secretary. The major was the only eight-hours-a-day man the Institute had and to him fell the job of carrying out the association's policies, collecting dues, handling all correspondence and editing the Institute's quarterly, the Journal.

He did this for 16 months without compensation, in the interest of the "collection and dissemination of scientific aeronautical information." He was later given the title of executive vice president, although the character of his work changed only slightly. C. E. Sinclair then became secretary. He still has that position in the organization today.

The major has seen a procession of presidents that included Hunsaker, Charles L. Lawrance, Donald L. Douglas, Glenn L. Martin, Dr. Clark B. Millikan, Dr. George Lewis, T. P. Wright. Maj. James H. ("Jimmy") Doolittle is the present chief.

As the full-time executive of the Institute, Major Gardner has his finger in many pies. Policies are set by the council, a board consisting of 12 members; and by the Advisory Board, a group of 20. Major Gardner sees that the policies are put into effect. In his roomy office in New York's Rockefeller Center, he presides over the national business, while from the walls he is watched by photos of aviation's "greats," hung in row upon row. In this office is a bookcase holding priceless volumes of aeronautical lore published as long ago as 1676.

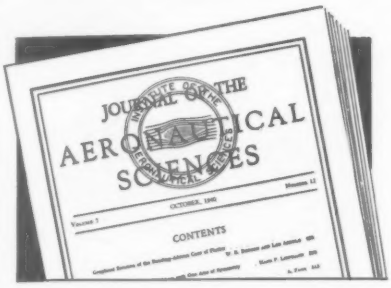
Of these the publicity-loving major is inordinately proud. "We get to think," he says, "that aviation is something new. But look, here's John Jeffries' book, 'A Narrative of the Two Aerial Voyages,' in which he describes the first balloon crossings of the Channel. Here's a report of an annual meeting in 1893—before the first Wright airplane was built, mind you —of the International Conference of Aerial Navigation. Here's one from 1784, a discussion of Montgolfier's experiments in aeronautics. Here's the first use of that word 'aeronautics.' "

He pointed to a Latin volume printed in 1676 giving theories of displacement. The author referred to "aero nautica." "Why, there's nothing new about aeronautics," he continued, pulling out books and shoving them back into the case too fast for the reporter to do more than grunt "oh" and "ah." "Why even Leonardo da Vinci designed aircraft." He rushed over to the desk for some hurried telephone calls, read a couple of letters and signed them, excused himself and went out to keep a luncheon appointment with somebody who had dealings with the Institute.

But when the major first took over the responsibility for keeping the Institute of the Aeronautical Sciences operating efficiently, his principal job was to find means of printing the Journal. Only by deft handling of finances was the Institute able to circulate its organ four times a year. The Journal now is a monthly and a pretty thick one at that. Dr. Hunsaker is editor-in-chief and George R. Forman managing editor. The major no longer has to worry about whether the Journal will come out or not, for during the presidency of Glenn Martin (1936-1937), the corporate membership plan was inaugurated. This enables companies that manufacture or produce supplies used in aeronautics to contribute an unspecified sum annually. This money supports the Journal and contributing corporations get, instead of advertising, the honorary title "Corporate Members of the Institute of the Aeronautical Sciences."

The Journal publishes scientific and engineering papers pertaining to aeronautics as well as accounts of Institute activities. Since many of the sciences affect aviation although they are not specifically a part of aviation, the Journal usually covers a large expanse of interests. Its circulation of 4,500 is on the upswing, although actual enrollment is 3,000.

Membership is divided into nine classifications, depending upon schooling, experience, academic position, published papers, membership in scientific and engineering societies, record of aeronautical designs created and "contributions to knowledge." Honorary Fellows top the list of members. They must be persons of pre-eminence in aeronautics and not more than one American and one foreigner can be elected to this position in a year. Orville Wright was the first Honorary Fellow. Honorary Members have performed outstanding feats and are elected for the period of one year. Men who have contributed at least $1,000 to the Institute become Benefactor Members. These three groups are honorary.



Circulation of the Institute's monthly magazine is 1,500 above total membership.

Maj. J. H. Doolittle

Fellows are persons of distinction in aeronautics who have made notable and valuable contributions in science or engineering. One step lower are the Associate Fellows who are members of at least six months who have been personally responsible for important aeronautical developments. Members are persons who have completed approved courses in engineering and have been in aeronautical work for three years. Industrial Members are those who have attained recognized standing in the aeronautical fields. Technical Members who comprise 900 of the total, are those engaged in aeronautical work. Student Members are undergraduates at Institute-approved engineering schools. Altogether, there are about 850 of them.

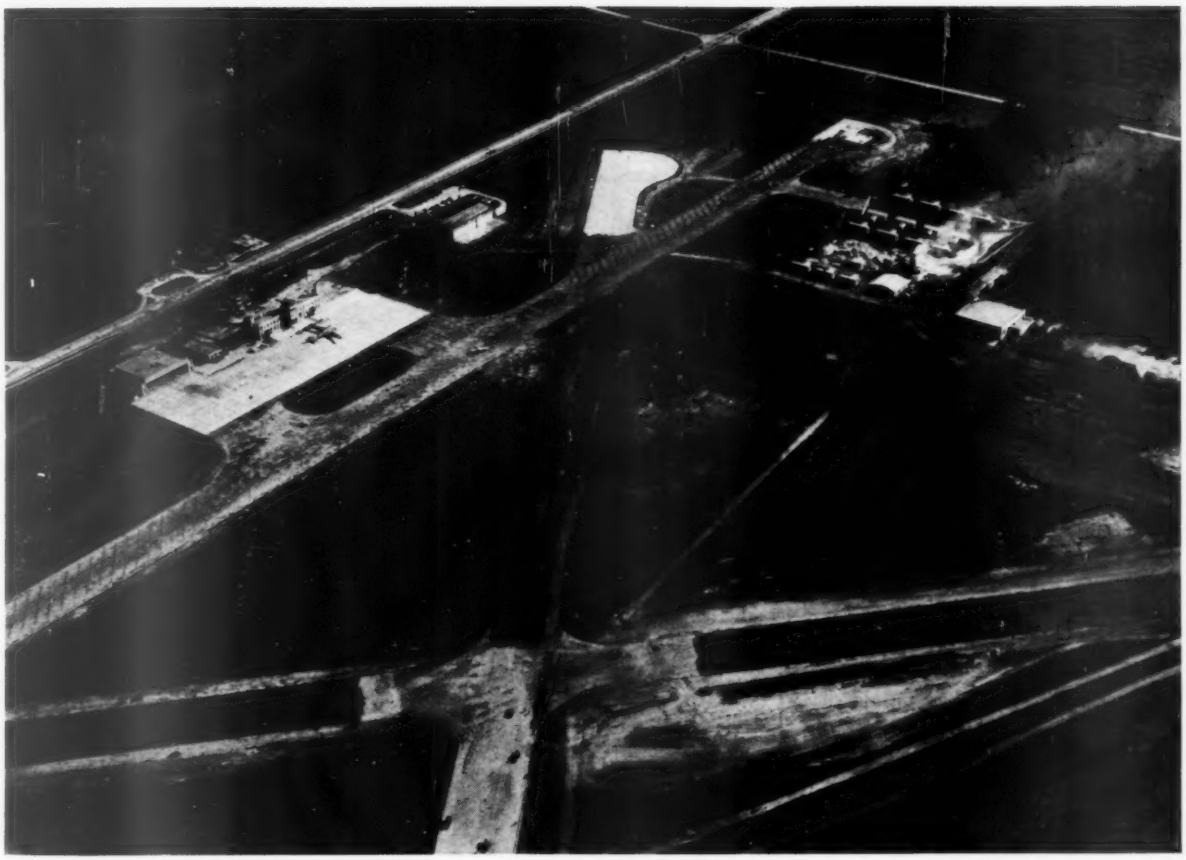
To gain membership in the Institute an aeronautical worker must be recommended by four sources known to the Institute, such as college professors, Institute members or industry executives. The applicant fills out an application blank stating his qualifications. This is examined closely by the admissions committee. Their decision is final and they are meticulous about whom they admit to the Institute. The Fellows elect Associate Fellows, Fellows and Honorary Fellows. In January, 1940, there were only 200 of the total membership of 3,000 who held the grade of Fellow or higher.

Honorary Fellows, Honorary Members and Benefactors are not required to pay dues and Student Members pay no entrance fees. Otherwise there is a $5 initiation fee and the following scale of annual dues: Student Members, $2.50; Technical Members, $7.50; Industrial Members, $12.50; Members, $12.50; Associate Fellows, $15; Fellows, $20.

It costs the Institute from $30,000 to $35,000 a year to get along. Revenues are brought in by the annual dues, benefactions, corporate memberships, Journal subscriptions, and library services, like photostating, research by trained librarians, preparation of special bibliographies. Major Gardner hopes that some day the Institute's endowment will be high enough to support it so regular revenues can be used for other purposes. Assets have grown from $1,100 in 1933 to $100,000 in 1940 and the national character has increased from the main branch only to seven active sections and 30 student branches. Sections are in Los Angeles, Seattle, Dayton, South Bend, Philadelphia and St. Louis.

The Branches and Sections generally meet once a month to discuss the latest developments or to hear special speakers or see movies. Headquarters in New

(*Continued on page 86*)



Shortest runway on Milwaukee County Airport is 3,700 feet. Upper right are individual hangars.

BIG BASE

by E. D. James

The City of Milwaukee has blossomed into a first-rank aviation center with the recent expansion of its airport to include a mile-long runway and 495 acres.

THIS is not a spectacular story. Perhaps the only redeeming feature is that it is illustrative of what is happening to aviation all over the United States. You cannot take out a map and put your finger on any locality and say, "Here is a spot where we can make aviation an important factor in the civic life." You have got to have: first, a need for aviation services; second, an airminded citizenry; last, a suitable terrain.

Milwaukee County, Wisconsin, started out with a suitable terrain. Seven miles south and a little west of the mid-west metropolis is a huge plain. If you stand in the center of it, you will see not a rise in the ground between you and the horizon and only such obstructions as a few shade trees and distant chimneys of manufacturing plants.

But Milwaukee lacked the two most important items in the establishment of an aviation center: the *need* for air transportation had not been felt; consequently, little interest in aviation existed in this county of three-fourths of a million inhabitants. Three years ago, therefore, the field which carried the impressive name Milwaukee County Airport boasted two 1,200-feet cinder runways and an expanse of mudhole-pocked land. The administration building might have been a holdover from the revolution, with well-worn wooden floors and small facilities for handling passengers and visitors.

Today, spread over 495 acres, reach four hard-surfaced runways, the shortest of which is 3,700 feet and the longest just short of a mile. In place of the old two-story frame residence, a brick and stone administration building modern as the blitzkrieg dominates the north end of the field. Two new hangars provide for the airlines (Northwest and Pennsylvania—Central) that use the field and an old one houses the local flying service. On the east are 15 individual hangars for lightplanes, looking like a cluster of dollhouses, and on the west are growing quarters for the 126th Observation Squadron of the National Guard. Total cost: $1,500,000.

Milwaukee's airport and its new prominence as an aviation center are the result of a selling job done by the county board, the airlines and the Government. Milwaukee county's board of supervisors, a governing body of 20 members, has been commended frequently for its progressive policies. And aviation has long been one of its favorites. It was the board of supervisors that pointed out they could build an airport that would be a credit to the community and pay its own way. The airlines, with representatives located in the city of Milwaukee, called on key men in the industrial community and sold them on flying.

(*Continued on page* 70)

One successful flying club is the Cub Fliers, made up of employes of the Piper Aircraft Corporation.

So You Want To Start a FLYING CLUB . . .

by George R. Reiss

If you have any questions on this subject you will find the answers here. Follow the advice herewith and your flying club will be successful.

SO you want to organize a flying club? It's a commendable idea and a fine way to fly cheaply and to have a lot of inexpensive fun and good fellowship, but . . .

Well, it's a dangerous business, too; full of pitfalls and lurking dangers—the dangers of disinterest, carelessness, neglect and resultant bad feeling—which are liable to make your flying club a very expensive experiment. But none of these pitfalls and dangers can't be avoided if you're fully aware of them, eager to avoid them and know where to look for them. So, go ahead and organize your flying club.

Scores of flying clubs throughout the United States are operating successfully today, enabling hundreds of men and women to learn to fly inexpensively and to continue to fly inexpensively—something that many of them would have been denied without the flying club.

Many of these clubs offer their members something more than merely cheap flying time—a comradeship which adds even greater pleasure to a very fascinating sport. Many have their own club rooms or club houses and many sponsor extra flying activities such as hangar parties, dances, banquets, air meets, breakfast tours, cross-country cruises and even inter-club competitions. There are a lot of advantages to

ACME

Many an air-minded young lady has learned to fly inexpensively in a flying club.

GROENHOFF

The modern lightplane is the ideal and almost universal ship for the flying club. The above "Cub" has skis.

belonging to a flying club—provided its a good club, operating effectively and efficiently. For one thing, it usually is cheaper—very much cheaper—than owning your own private airplane or renting one from an air service operator.

If you owned a private ship, you'd probably not fly it enough each year to keep down the hourly cost for depreciation, hangar rent and other fixed charges even to the rates charged by the fixed base operators. If you rent a ship from a fixed base operator, you've got to pay him his rightful—and usually quite reasonable—profit.

If you rent, you'll find still another shortcoming. Cross-country trips are one of the principal joys in flying. Few operators, though, like to let you take one of their ships out for a long cross-country tour, especially if you're planning to make reasonably long stops between hops. Usually it seriously inconveniences him, for he probably is a little short on equipment to handle all his students and he'd rather have the ship stay near his airport where he can keep an eye on it—and where it can bring in the maximum number of dollars each day.

There's nothing very new about the flying club idea. There have been flying clubs for years—but most of them got off to a bad start and earned for themselves a bad reputation. Too often, these clubs picked tricky airplanes, ships with dangerous flight characteristics. Too often they picked incompetent instructors, fellows who had just a little experience and were willing to fly for little or no pay just to build up their flying time. And too often, these clubs ended up with their ships spinning in, killing or injuring one or more members and leaving the remaining club members with a hatful of unpaid debts, a sinking feeling in the stomach and a disillusioned attitude toward all flying clubs.

The clubs had a hard time overcoming that reputation, but they are coming into their own today. The modern lightplanes are safer, more reliable, cheaper and easier to fly. Instructors know their business and have a hard-boiled attitude —and the country's full of very successful flying clubs. All it takes now is the desire, a little ready cash and the "three C's of flying"—cooperation, courtesy and common sense. Today any of the major lightplane manufacturers—Piper, Taylorcraft, Aeronca, Luscombe, Porterfield, Culver, Funk and others—will be eager to give you many valuable tips in organizing, in helping you to pick the right ship for your particular job and even help in financing it.

If you're going ahead to organize, here are a few friendly little tips from the president of a rather successful club, who also has observed at close range the operations of some other clubs:

Keep your membership between 10 and 20 persons for each ship. Under 10, the individual cost runs too high and, with more than 20, you've got an unwieldy group and much dissatisfaction among the members when they can't get the ship promptly. Choose your members carefully. Pick the earnest, serious, steady type of fellow who is most likely to retain his interest and doggedly stick out the discouraging task—for some persons—of learning to fly. Very studiously avoid the "show-off," the flash-in-the-pan type. It's easier to keep him out at the beginning than it is to get rid of him later; just one such member can ruin the club, if not by wrecking or damaging the ship in showing off for his best girl, then by causing enough discord among other members.

If the club is to be composed chiefly of beginners, make it *entirely* of beginners, keeping out the private pilots or the solo students who'll try to horn in. They're too liable to lord it over the greener members, hogging the ship and causing discord.

Pick your flight instructor very carefully, for the most expensive instructor is quite often the cheapest instructor in the end. He should be a certified instructor with a commercial certificate and should at all times have direct charge of the plane and exercise control over all members in its operation. Haphazard control of flight operations

(*Continued on page* 66)

Consolidated's giant plant at San Diego currently is undergoing huge expansion.

Let's Defend What We Have!

by JAMES BASSETT, Jr.

Suggestions that our west coast aircraft factories move inland for safety are more wishful thinking than anything else. At least that is the contention of one group of California's aviation strategists.

TO BE exact, former Assistant Secretary of War Louis A. Johnson started the whole thing back in 1939's portentous winter with his now-historic plea: "For God's sake, get yourselves established inside the country's mountain chains." Mr. Johnson was speaking to the aviation industry; to the Pacific Coast aeronautics business. His Chicago utterance, for which there was hell to pay among manufacturers who had sunk multi-millions in huge western plants, indicated a fear which nobody, until then, had dared broach.

Of course, Mr. Johnson made the error of hinting that orders might be curtailed unless the Pacific planemakers retreated inland.

With a (then) $200,000,000-odd industry functioning rather busily, it appeared hardly likely that Southern California and the Pacific Northwest would be overlooked when the placement of big Government aircraft contracts came 'round.

But Mr. Johnson stirred up a lot of

TWA

Giant plants like Vultee (right) and Lockheed (right center) can't be dismantled and moved.

hard thinking. His remarks eventually resulted in the semi-official whisper that the Federal government might actually demand that plane builders at least find auxiliary plants beyond the Rockies and west of the Alleghenies; that the R.F.C. might even lend the money for such expensive projects.

Since Mr. Johnson pushed back his pieplate at that Chicago banquet in 1939 much water has flowed under many bridges. We have seen international boundaries fade like last year's snows, air forces make mockery of onetime "safe distances" and even the supposedly "isolated" Western Hemisphere jockeyed into the position of looking to its defenses.

Consider a few facts. In Southern California alone, from the Mexican border to the Tehachapi Mountains which fringe the upper Mojave Desert, sits the (present writing) $1,000,000,000 aircraft industry, the multi-billion dollar petroleum interests, the tenuous waterways that bring life's blood 200 miles from the Colorado River to the 2,500,000 inhabitants of the alluvial plain of Los Angeles, and the vital electric-system that spiders westward from the mighty turbines of Boulder Dam.

All this is worth defending. Each depends on the other: to create its maximum (as of January 1) 15,000-18,000 airplanes per year, the aviation industry must have hydroelectric power from the Colorado. It needs its share of the 3,500,000 people living in the southland. And *they* urgently need the water that streams southward and westward through oftimes exposed aqueducts. What's more, all these make pretty obvious targets for any bombardment plane that conceivably might sneak past fortifications, fleets and warning systems.

By the first of 1941, the 10 major aircraft and engine factories in Southern California, where better than half of America's dollar-volume of aviation business is done, will comprise some 7,000,000 square feet of floor space. They sprawl under the bright sunlight like so many roofed football fields. They will house more than 60,000 workers.

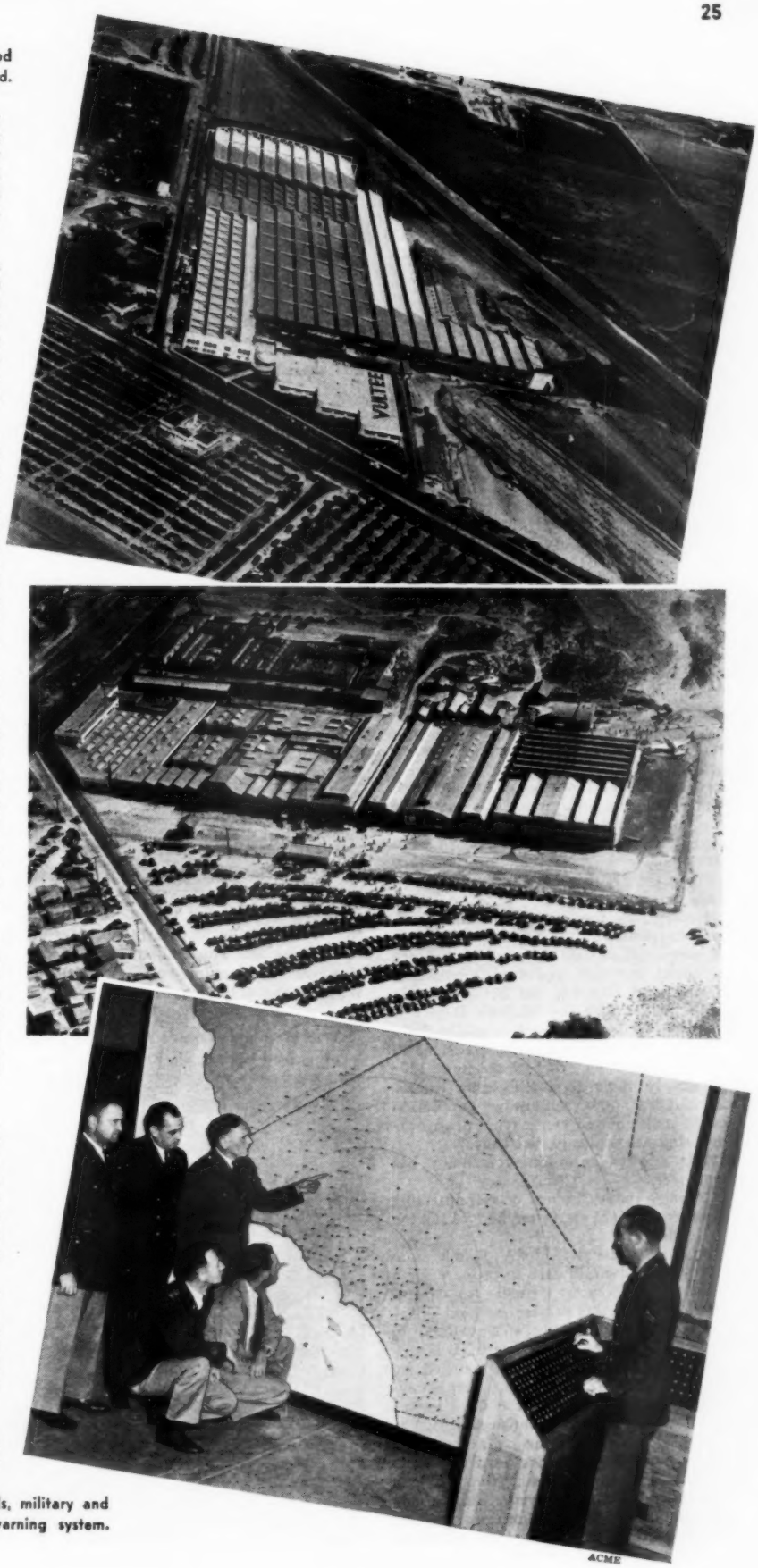
They can't be moved.

By their own admission, aircraft executives state that erection of secondary plants at such inland cities as Denver, Terre Haute or St. Louis would stymie attainment of their production goal by at least 18 months. We know that output now is important. Since we desire 50,000 or better planes per year, we must look to our present facilities.

This being the undeniable case, it boils down to a matter of defense—strict defense of the entire West Coast, at least 400 miles of which (San Francisco to Oregon) have neither seaside or inland military establishments. For you can't defend "just part" of the whole.

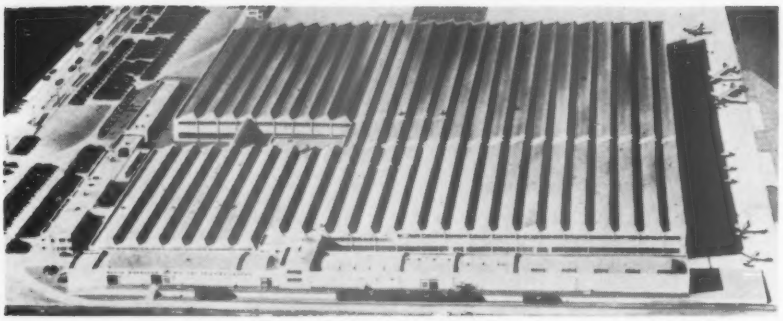
We must protect what we have.

In simple language, let's review what Southern California itself possesses for



To protect the Pacific Coast against air raids, military and civil officials devised an amazing civilian warning system.

ACME



Almost every major aircraft manufacturing plant, like North American's huge factory at Inglewood, Cal., is expanding or already has expanded as much as 100 per cent.

this hypothetical guarding against an even more hypothetical enemy. We can't rule out the likelihood of attack or even invasion, for the entire $10,000,000,000 military-naval expansion has been geared to just such a grim possibility. Besides: until a very few years ago the Army's strategy for the southern West Coast in wartime entailed the actual *abandonment* of the littoral to an invading army—and a retreat beyond the mountains. It was felt that the chasmlike passes leading to the desert-inland of California could be successfully defended.

Then things happened. Southern California grew, just as we have shown earlier. Its greatest single item of maturity appeared in today's No. 1 military consideration which is, of course, aircraft manufacturing. They discovered fabulous oil deposits on Long Beach's rich Signal Hill and on practically every little earthy nubbin in the county. That Naval bases at San Diego and San Pedro were strategically the best for simultaneously watching both Hawaii and Panama, became apparent.

Besides, as the population increased, experts realized that a mass evacuation of metropolitan Los Angeles in the face of aerial invasion would be impossible. France and Belgium did it. California couldn't, because the Mojave Desert is too wide. The millions of people in flight would have to be transported east of El Paso before they reached territory able to supply their food-and-water wants. Back home, the remaining population could soak enough water from deep-hidden supplies under gravel beds.

That's why the military strategy has changed.

Nobody today dreams of relinquishing Southern California to anybody. It's too valuable.

But can it be defended? Frankly, no Army officer would care to prepare for a knockdown, dragout struggle for control of the west at this precise moment—particularly if the Fleet weren't available to keep an enemy at arm's-length. It is significant that every problem worked by National Guard, antiaircraft maneuverists or the Air Corps these days begins from such a gloomy premise as this:

Called to the Atlantic by a European emergency, the Fleet has been unable to return w e s t w a r d, for the Panama Canal has been destroyed. Taking advantage of this sorry situation, an enemy force (variously estimated at 200,000 to 1,000,000 men) has effected a landing along the west coast of Baja (Mexican) California and has struck northward toward the wide-open Los Angeles-San Diego industrial area.

That is no creation of this writer's imagination. It is, to the letter, the "problem" worked by Regular, Reserve and National Guard anti-aircraftsmen in the spring of 1939. We will tell a little later what happened when the defending Americans met the invaders.

What does California—plus the northernmost outposts of Alaska and the Pacific Northwest—possess as protection—actual *fighting* protection in guns and men and bases?

Since last September 1, when Hitler's invasion of Poland began, Army and Navy men have clamped down on dissemination of information. Fifth columny has become a menace, so facts are meager. But we know that little has been added to 1939's available butresses in the past eight months. Our defenses are largely on order.

We know that for the south's ultra-rich territory, the three arms of primary defense include The United States Fleet, March Field (headquarters of the First Wing of the G.H.Q. air force) and Fort MacArthur, which commands the harbor of the city of Los Angeles.

Take the Fleet. At last accounts it lay at Pearl Harbor, one of the world's really A-1 naval centers, casting anxious glances to the west (Asia) and the east (Panama). It's still a one-ocean navy. It might some day face the dilemma of rushing to the Atlantic and leaving only a token sea-defense in the Pacific. This would be a sad moment for California. Small wonder some of the staunchest "two-ocean navy" advocates live here.

Take March Field. Considerably less than 200 first line aircraft base at this flat, ample base some 60 miles due east of Los Angeles on the way to the Colorado River. Until recently, it was strictly a home for bombardment and attack craft. A few weeks ago the G.H.Q. diverted a few dozen Curtiss P-36's from Moffett Field (Sunnyvale) to March. Europe's blitzkrieg had shown the efficacy of having fighting planes ready for lightning-thrusts at equally lightning-jabs of an enemy. As is nothing else on wings, pursuits are defensive machines.

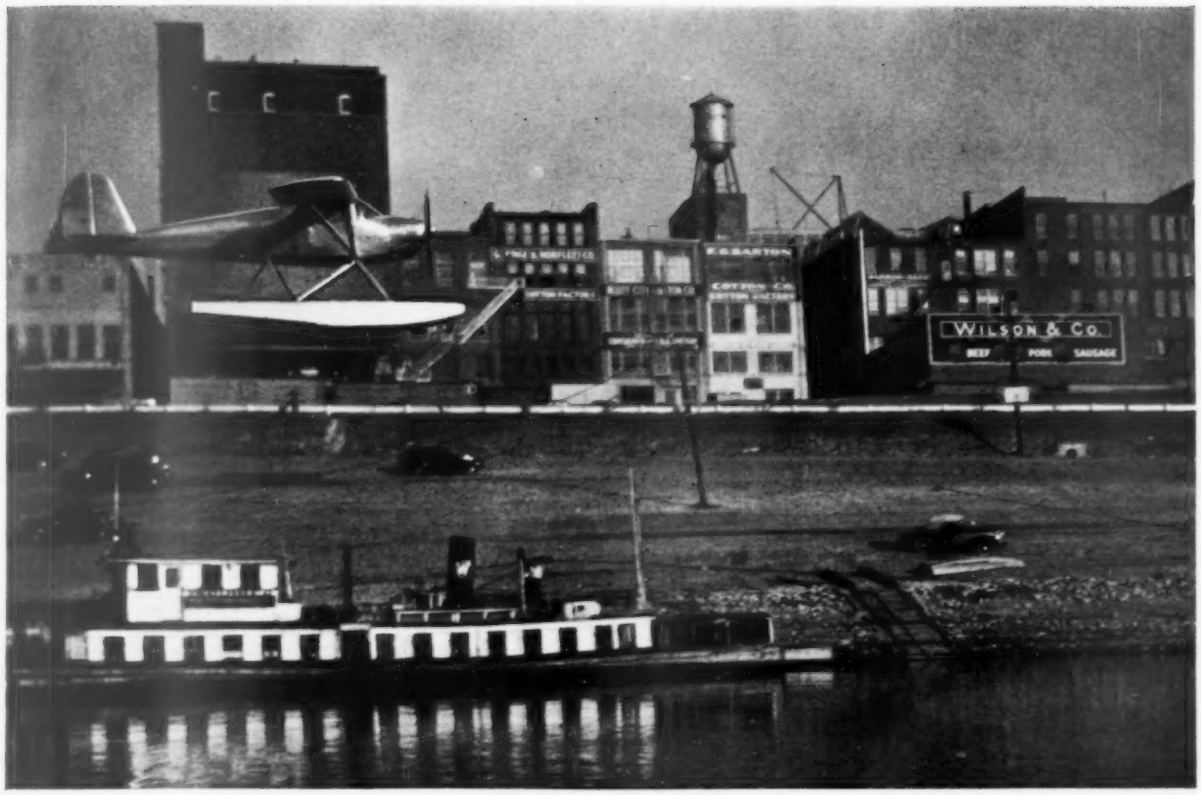
Take Fort MacArthur. Here sits one of the Pacific Coast's three complements of long range 14-inch coastal guns. These weapons aren't even as modern as San Francisco's 16-inchers. Militarists have admitted the fort's inadequacy; Congress has charged it. Some improvement is promised—for the near-but-when? future. In addition to the pair of 14-inch guns, the 1,700 officers and men of MacArthur handle several batteries of three-inch rapid fire antiaircraft guns, .50-caliber machine guns and a few 12-inch howitzers and 155-millimeter guns. Even these haven't been fired for years for fear of shattering nearby windows.

Technicians know that this set-up doesn't compare favorably with needs or with the terrific artillery concentrations shown to be absolutely vital in Europe. They hope the reinforcements will arrive soon.

Let's cruise hurriedly up the California

(*Continued on page* 60)

World's largest plane factory is the Douglas company at Santa Monica. Main purpose of nearby military air bases is to protect such vital but vulnerable targets as this.



WINGS UP THE RIVER

Warner and Tamble's Luscombe glides down onto the Mississippi at Memphis.

by MERVIN ROSENBUSH

Photographs by the author.

Two old time Mississippi River steamboat men have discovered that aviation can do wonders for their business. They now have two planes.

A NEW day has come to the Mississippi and Old Man River, just a bit skeptical of motors roaring overhead and floats tickling his broad back, is seeing that aviation does have a place in his scheme of things.

Warner and Tamble, a firm of barge and tow boat operators at Memphis, Tenn., have brought an experiment to the Mississippi Valley which is daily proving the value of a float-equipped airplane in the million-dollar river transportation business.

Capt. Russell Warner and Herman Tamble, owners of the company, can fly —but they are not airmen. They were born, bred and raised to the river and it is the fact that they are the pioneers in a new use of aircraft which is attracting the attention of other rivermen. Their firm, the oldest and largest in the lower Mississippi Valley, operates from St. Louis to New Orleans, shuttling huge barges of freight up and down the river, salvaging stricken river craft, making the short-haul mail and express runs which were the work of the packet boats of another day.

Warner and Tamble belong to that close-knit fraternity of quiet men who have spent their lives learning the secrets of the Mississippi's shifting channels and it isn't often that such men stray far from the river.

It was about six months ago that a visit to an airport near Memphis infected Captain Warner with the flying bug. Walter Hutchins, brother-in-law of Tamble, was a student at the field and probably should be credited with much of the "selling" of aviation to the river partners. He persuaded Captain Warner to take a ride. The veteran river pilot liked it.

After almost 50 years of running steamboats, Capt. Russell Warner began learning to fly! The field was near the river and whenever Captain Warner was aloft, he could see the Mississippi—a broad, brown flood snaking toward the Gulf of Mexico.

"That's a road I know," Captain Warner told us. "I didn't belong over land. I belonged over water. So I asked a few questions."

The effect of those questions was immediately felt by Upton and Bowen, operators of the flying field at West Memphis, Ark., and distributors for Luscombe airplanes. It was felt almost as quickly at the Luscombe factory where a new 65 h.p. trainer started down the assembly to meet the pair of Edo floats which were to form its landing gear.

It wasn't long after that before Joe Bowen, young insurance man-airport operator, was flying the new plane cross-country, delivering it to its new owners.

Caught in a Mississippi ice jam, these Warner and Tamble barges, heavily laden with freight, were guided into clear water by the company plane in just a few minutes.

Bowen arrived early one Sunday afternoon. He made a sweeping turn over Memphis' historic waterfront, came in and landed. The Luscombe taxied up to a newly-built ramp alongside the Warner and Tamble wharfboat.

The Luscombe hadn't been delivered 24 hours before it went to work. There was a tow job to be bid on at Hickman, Ky., 100 miles up the river—a two-day trip by boat. Captain Warner looked at his new seaplane and shoved back his hat.

"Crank 'er up, boys," he ordered.

Joe Bowen

He was back in a bit over two hours, the contract in his pocket and, as if fate were taking a hand in the testing of the plane, things were happening. The towboat Captain Warner had counted on to bring down the barges he had just contracted was tied up at Helena with a bad air compressor.

"So, I took off again," Captain Warner told us. "When I got there I found that a real repair job was needed and that the compressor had to be brought to Memphis to be fixed at all. We knocked it down and loaded it into the plane's baggage compartment and onto the passenger seat. It weighed about 200 pounds, all told.

"I didn't know much about how the plane would behave with that much weight, but I had the whole river to find out in so I went ahead. She came off like there wasn't a thing in her fuselage but me!"

Result was that the compressor was speedily repaired in the Memphis shops, flown back to the boat, re-installed and the tow came down the river on schedule.

"It'd have cost $50 to do all that running around by boat, even if I hadn't lost the job by not being able to move it on time. The Luscombe did it on a couple of tanks of gas. Think it cost about $8," Captain Warner said.

In seven days that followed Warner flew to Hickman and Helena again; to Carruthersville, Mo., and to St. Louis, twice—all on river business. The ship—bought as a pleasure craft—was earning its keep and showing the river a thing or two in speed and utility. It was operating at less cost than a speedboat and cutting days from trips where time was priceless.

Captain Warner had made inspection runs to check on the position of his company's equipment. He had flown commercial paper and bills of lading. He had checked on channels as river levels went low and finding deep water became a problem for the U. S. Engineers. There didn't seem to be any limit to the usefulness of a seaplane in barge line operations. Take what happened when the writer was in the barge line office:

The radio in Warner and Tamble's model communications office—only one on the Mississippi-Warrior system equipped with ship-to-shore radiotelephone—flashed a call from Helena, Ark. A transfer boat which ferries loaded railroad freight cars across the river at that point had gone aground. Here was an emergency warranting prompt action. Besides the danger of damage to the "back" of a $100,000 boat which increased with every minute the boat hung on the shoal, rail schedules were tied up on both sides of the river.

What was needed for the job? That was Captain Warner's question. To send a big derrick boat when a smaller tug could do the job would be a waste of money. To send too small a salvage craft would be a waste of time and money too. Captain Warner was cranking his seaplane before the radioman had his message typed.

He was back at the Memphis wharf half-an-hour later, a clear picture of the situation fixed in his mind as a result of aerial and water observation. A few minutes later, Warner and Tamble's biggest towboat, the *Mary Elizabeth,* was en route to Helena.

Don't get the idea that Captain Warner is an experienced pilot. At the last counting, he had only 65 hours. It is the simplicity of seaplane operation on the Mississippi which has enabled him to accomplish feats creditable to a much more experienced airman. He doesn't do all the flying, either. Herman Tamble also has learned to fly and makes many of the trips as does Walter Hutchins, first member of the river family to take the air.

Captain Warner

Remember, their plane was bought as a "toy"; as a means of diversion, not as a part of their river equipment—but this has not kept it from doing a full day's work. "And that's why we're buying another one!" says Captain Warner.

The new plane will be a 75 h.p. *Silvaire*—on floats, of course. It will have two-way radio, operating on the wavelength of Warner and Tamble's ship-to-shore system, WJG, if the Federal Communications Commission approves. Inspectors for the FCC now are investigating the Warner and Tamble set-up and, if they approve the new plane on the ship-to-shore circuit, it will be the first time in history that a pilot flying a seaplane over the Mississippi River can call his home telephone number and ask his wife what she plans to have for dinner.

Thus it will be possible for Captain Warner and Herman Tamble or whoever is flying the company's ships to keep in constant touch with headquarters even though they may be flying over some part of the 2,500-mile long Mississippi. This new wrinkle should attract the attention of many another private flyer—provided, of course, approval of the FCC is forthcoming . . .

The new airplane will be named, as is the custom of all watercraft, and entered on the company's books as a boat of the Warner and Tamble fleet. It was first planned to trade in the old plane but now the partners are convinced there is use for both ships and besides, they figured, Memphis is a river town and it should be possible for Memphis students who so desire to get seaplane time.

So the first Luscombe will stay and when the river doesn't need its fleet wings, student flyers will be learning how to take off and land on the Mississippi. Who knows, they may become a new generation of "river pilots."

What do other rivermen think? First, remember that Warner and Tamble is the leading river line. What they do, others will follow.

"This hasn't been the river of Mark Twain for 50 years," veteran Joe Curtis, river pilot and author, wrote in the Memphis *Commercial Appeal.* "The river hauls heavy freight, now, where it used to carry the elite of the passenger trade. But we're keeping up with the times and if airplanes are doing all right over land, they'll do all right here over the river."

Joe Curtis speaks the mind of those who follow the Mississippi. The river has grown a pair of wings and they are there to stay. Warner and Tamble have proved it.

END

Steele (left) explains his Aid to Pilots to a friend.

Pilot WITH AN IDEA

by EDWARD CHURCHILL

C. Earl Steele was so disturbed by the complex Civil Air Regulations he went home to figure them out. Now they are his business.

AVIATION, just like any other industry, demands new ideas. And as often as not these ideas don't necessarily have to do directly with airplanes and their equipment. The field is wide open as the case of C. Earl Steele proves.

Earl Steele is a pilot with 9,000 hours of flying to his credit. Furthermore, he holds an airplane and engine license. But Steele didn't call on either his profession or his craft for an idea which is paying dividends not only to himself but thousands of pilots throughout the United States today. When the new Civil Air Regulations came into being about three years ago plenty of harassed pilots and students complained that they were too complicated. Nobody could make anything out of them and to some they seemed to be full of a maze of contradictions, duplications and "double talk." A friend said to Steele: "Maybe I'm dumb. I don't know. But I'd give a million bucks to have those regulations translated to me."

Steele went home that night, began a study which lasted for months. Before he got through he had compiled an amazingly simple little book called Aid To Pilots. Today, kept up to date by Steele with every minor change of regulations, it has run through five editions and more than 10,000 copies have been sold. The first copy came into being some 19 months ago. Steele has made himself no fortune. But he does get credit for having an idea which just about anybody else could have had at the time, plus the energy, the tenacity and the ability to carry it to a conclusion.

"My thought hasn't been to make money," he says. "My thought has been to help out all the confused fellows who tried to wade through the regulations and understand what they meant." And today practically every flying school in the country has more than one copy and flyers refer to it as "the vest pocket bible" of the industry.

Steele, after months of study, has some interesting conclusions to make in regard to the Civil Air Regulations which he knows just about as well as anyone alive, including those who wrote them.

"In the first place," he says, "they weren't written with the idea of deliberately confusing people as some have jokingly claimed. Each regulation is as clear as can be. There is absolutely nothing wrong with them. Any misunderstandings about them have risen from misinterpretation. That's where all the trouble has come from.

"Second, the reason that the terminology may seem unusual to the lay mind of the average pilot is that it is legal in nature. Each regulation must be stated without equivocation. From each regulation there may arise a law suit and that law suit will require legal interpretation. Therefore, the method must be as it is.

"Third, I've heard hundreds say that aviation would be better off with no regulation or 'a few simple rules.' Let me assure you that today there are far fewer Civil Air Regulations than there are state, city and county automobile laws. Not only that, but the C.A.R. are much clearer than many state measures designed to control the operation of land vehicles.

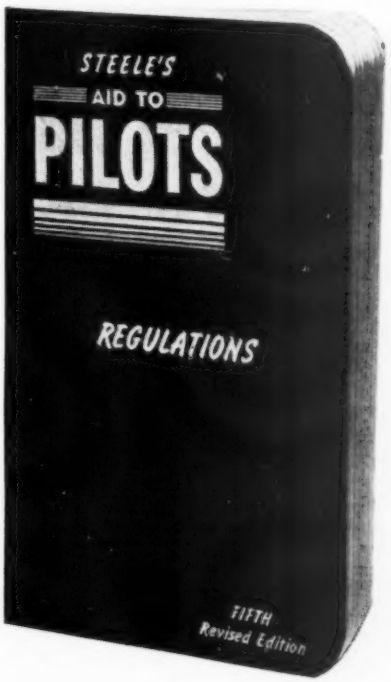
"Fourth, the main problem at present is the proper observance of regulations. I have come to be a stickler for that because I realize their value. The beginning flyer must realize right now, today, as he undertakes his study of them that they are not designed with the thought of 'making aviation harder' but with the sole aim of properly safeguarding everyone who flies in or flies an airplane in the United States. It is neither wise nor smart to try to 'beat' the regulations. Every time you succeed you haven't added to your own glory, but have served to defeat a common cause—the advancement of aviation. Why? Because you are taking a chance which may result in a serious accident to yourself, your passengers or those on the ground.

"To those who contend that the regulations are onerous and should be abolished; to those who are far from the keen eyes of a C.A.B. inspector and who think it is smart to 'put one over'; to those who wilfully or carelessly insist on violation of any nature, let me assure you that you are doing harm and *defeating your own purpose.*

"The result of violation of the currently effective C.A.R. will result in only one

(*Continued on page* 68)

This little booklet has become a familiar and important sight to many U. S. flyers.



At least one automobile body manufacturer will build sections of this Douglas A-20A.

AVIATION INVADES

With war orders piling higher and higher, the automobile industry has been called to the aid of the swamped aircraft manufacturers.

by ROBERT S. BALL

DETROIT, the automotive capital of the world, today is preparing for a major role in the production of military aircraft and the engines with which to power them. How large an undertaking this program will prove to be, how long it will last, no one is prepared to estimate. Whether Detroit will find this new activity to its liking and seek to remain in the picture after the pressure is off and peace again pervades the earth, no one is willing to predict.

This is merely an accounting of the program as it is known today, and as it is likely to shape up in the immediate future. It must be borne in mind that today's plans (end of December) may be old stuff by the time this is published —or may be in the ashcan in favor of something new.

Already in black and white and down on the books are $539,000,000 worth of orders for airplane engines and aircraft sub-assemblies, plus options for an additional $312,000,000 worth of engines. The bulk of this business is split between Packard Motor Car Co., which is preparing for the production of Rolls-Royce *Merlins* for Britain and the United States, and Ford Motor Company, which is to undertake production of Pratt & Whitney *Double Wasps* for Uncle Sam.

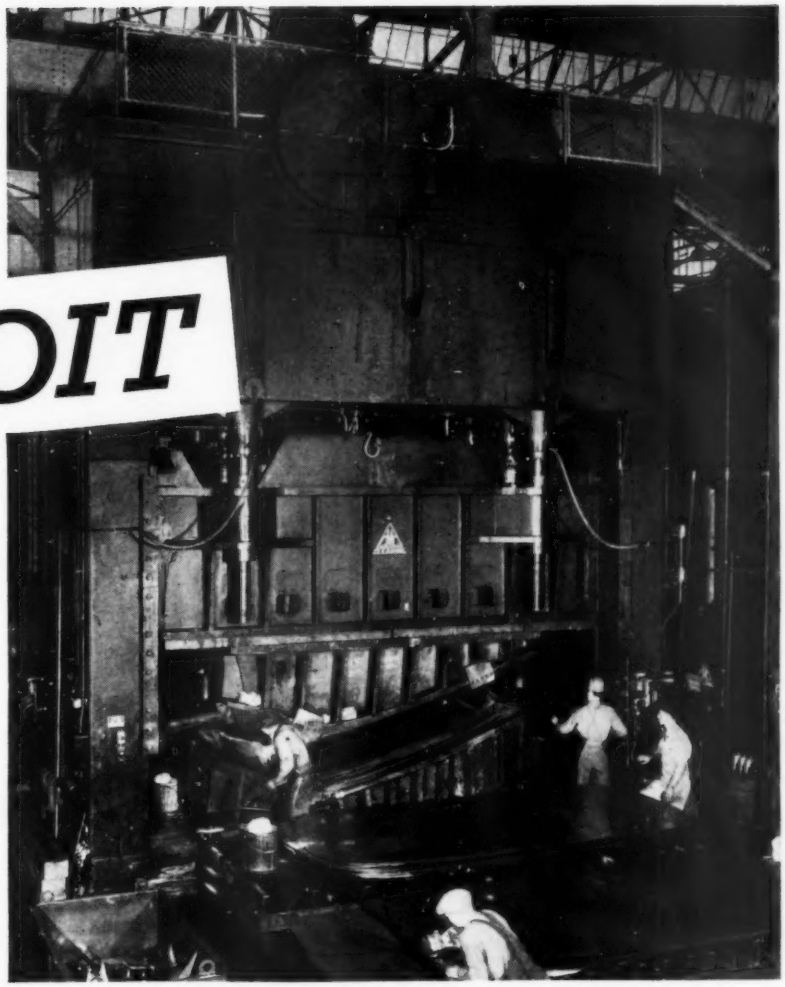
Now that is a pretty sizeable backlog for a town which a year ago was only a fly speck on the aviation map. Yet it appears to be only the beginning. Eighty-six per cent of that backlog is for engines. Aircraft structures is the next big item—approximately $1,000,000,000 worth as a starter, according to best estimates.

This little item concerns fabrication of parts and sub-assemblies for 24,000 British and American bombers within the automotive industry. Final assembly will be done in new plants to be built by the Federal Government in the middle west. The plants will be owned by the Government but operated by private industry.

Elmer A. Burdg, supervisor of the production engineering section of Wright Field's materiel division, inspects parts and castings to be made by automobile factories.

Combat plane types tentatively selected for this huge program are the twin-engined Martin B-26 attack-bomber; the twin-engined North American B-25 attack-bomber and the four-motored Consolidated B-24 long-range bomber. Each design is to share one-third in the total quantity to be ordered, it is understood, so that Britain alone would get 4,000 of each model.

North American Aviation, Inc., of Inglewood, Cal., and the Glenn L. Martin Company, of Baltimore, Md., two of the three primary contractors involved, will manage and supervise operation of the new mid-western assembly plants. Kansas City already has been named



The giant press at right is stamping out automobile roofs, soon may be working on warplane orders. Machinery like this will greatly expand aircraft production.

DETROIT

the site of one of the plants—to be operated by North American. And Omaha, Neb., has been named as the site of one of the Martin-managed plants.

Preliminary estimates are that each of these two plants will cost in the neighborhood of $10,000,000, will employ between 10,000 and 12,000 men and have an annual capacity of approximately 1,200 planes each. How many additional assembly plants will be designated is, at the time of this writing, a matter of conjecture. At least two more are known to be planned.

While first announcements indicated total annual capacity of the automotive industry's parts program on the bomber deal might not exceed 5,000 planes, it is believed this estimate will be boosted as studies progress.

Both the North American and Martin bombers are said to be engineered to facilitate production in considerable quantity and production experts from both the automotive and aircraft industries are reported to be studying the Consolidated design with a view to making it more adaptable to quantity output.

The go-ahead signal for this gigantic bomber procurement program was given October 25 by William S. Knudsen, production chief of the National Defense Advisory Commission, at a meeting in Detroit with 65 representatives of the automobile, truck, body and parts industries. It is understood that, at that time, only the British desire for 12,000 bombers was the inspiration for Knudsen's meeting (a desire which was not made public until some days later by President Roosevelt in a campaign speech at Boston), although since then machinery has been set in motion to cut the Army Air Corps in on this new program.

The story now is that the Air Corps will duplicate the initial British order for 12,000 units of the three types already described. Legislation to provide funds for the Air Corps orders now is in the hands of the Budget Bureau and was not expected to reach Congress before January.

Meanwhile, the Automotive Committee for Air Defense, organized within the industry following the Knudsen meeting, has plunged into the task of surveying available plant space, tools and other production facilities in automotive factories for this aircraft program and of educating its membership in the type of fabrication work expected of it. The ACAD has established headquarters in space leased from the Graham-Paige Motors Corporation, in Detroit and there has set up a preliminary exhibit of blueprints, parts and sub-assemblies of contemporary combat craft similar to those involved in the projected program.

More than 500 executives, engineers, plant layout men and cost and time study experts have visited this display in an effort to learn what is to be expected of them. The exhibit includes landing gear struts, wing and tail assemblies and a variety of forgings and castings.

Maj. James H. ("Jimmy") Doolittle, famed speed flyer now on active Army duty, is functioning as liaison officer between the Air Corps, the Defense Commission and the automotive and aircraft industries with the official designation of assistant district procurement supervisor, Detroit district.

W. F. DeGroat, who has had more than 20 years experience as an aeronautical engineer, most recently with Barklev-Grow Division of Aviation Manufacturing Corp., has been named technical advisor to the automotive committee. Elmer A. Burdg, company production supervisor of the production engineering section, Air Corps material division, is in charge of the parts display.

C. C. Carlton, vice president of Motor Wheel Corporation, Lansing, has been named permanent director of the automotive program. Serving on the committee are Edsel Ford, president of the Ford Motor Company; C. E. Wilson, acting president of General Motors Corporation; K. T. Keller, president of Chrysler Corporation; Alvan Macauley, chairman of Packard Motor Car Company; William P. Brown, president of Briggs Manufacturing Company, and I. B. Babcock, president of Yellow Truck & Coach Manufacturing Company. And these men are not just figureheads. They are actively concerned with the success of the program.

As soon as possible, parts and assemblies of the types to be built in Detroit will be shipped to the ACAD exhibit and

(*Continued on page 72*)

Members of Hector's very active flying club do a little brainwork on the subject of map-reading for cross-country flying.

HIGH-FLYIN' HECTOR

by JOSEPH W. MORGAN

This little Minnesota community is the most air-minded town or city in the United States. Practically everybody flies, old or young.

Photographs by H. V. Sommers

LET'S drop in on Hector, Minn.—"the most air-minded city in the United States"—where 40 per cent of the men between 18 and 40 years old are either pilots or student flyers.

In a city where nearly everyone from six to 60 either flies or wants to fly, you might well expect to find a bustling airport with gleaming white runways, a steady drone of planes overhead and a number of huge hangars.

Instead of this you find:

A rolling pasture-like landing field only two blocks from Main street.

Four unpainted hangars which creak and shudder in a brisk wind.

Five planes—the largest a three-place open ship.

Can this be the nation's most air-minded city? You look at the airport and you look at Hector and you say:

"No, it can't be. There are hundreds of sleepy little country towns exactly like this in every state."

And Hector is a typical agricultural community with a population of 1,044. There may be only one Hector, Minn., but you can find its counterpart in Illinois, in Oklahoma, in Ohio, in Oregon or anywhere. There's the general store, the post office with the benches out front on the sidewalk, there's Buck's Cafe where the cross-country bus will stop if there happens to be a passenger, there's the bank and, at the end of the short street, there is the little city park with a square bandstand and a civil war cannon.

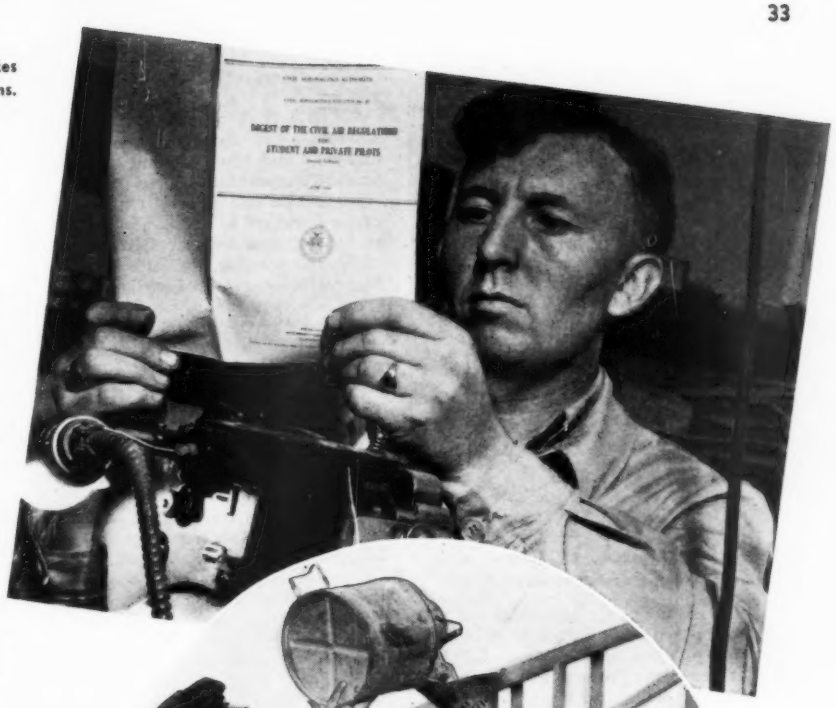
Yet, Hector claims to be the most aviation-conscious city in the nation—and can produce the figures to prove it. Of the town's one thousand residents, 45 do solo flying and more than 75 are students.

Under such conditions the airport, even with its poor facilities, is the most popular spot in town. If you walk into Buck's Cafe and ask where to find Mayor O. E. Smith, one of the old-timers playing pinochle at a rear table will shift his chew of tobacco and snort:

"Out to the airport, of course."

As if anyone with all his senses would expect to find the mayor of Hector anywhere but the airport. The answer will be the same if you ask for any member of the city council—O. W. Melberg, Douglas Fahlberg, C. M. Kirkpatrick or Ralph Boss. If Alfred Ericson, manager of the Hector independent telephone company, is not in his office you can find him at the airport too. At 57 he is Hector's oldest flyer and he took his first lesson only a year ago.

If the shoe store is closed it's a safe bet that its owner, Carrington Fahlberg, will be found out on that plot of wind-swept prairie which Hector proudly calls "the



Carrington Fahlberg, Hector shoe store owner, takes a moment from work to study Civil Air Regulations.

airport." The same goes for Bernard Torbert, the implement dealer; and Chester Anderson who, with his wife, runs the "coffee bar." Torbert is president of the Hector flying club and Fahlberg is the secretary, but neither of them owns an airplane.

The rest of Hector's residents concede that the airplane has just about replaced the horse and buggy. Airplane trips—although they have only five planes among them—are common for many residents. It is no trick to fly the 85 miles to Minneapolis for a few hours of shopping. At least two farmers often deliver their eggs fresh to market by plane. Another farmer plans to use the airplane to deliver baby chicks next spring. Torbert, the implement dealer, calls on some of his customers by plane. Ninety per cent of the town's young student flyers hope to make aviation their vocation.

In spite of their poor facilities, Hector's flyers are good pilots. Three of them were hired only a few weeks ago as instructors at other airports. There never has been an accident at the Hector airport and no Hector flyer ever has been involved in a serious accident anywhere.

"We obey the rules," Fahlberg said in explaining this record, "that's all there is to air safety."

The question which occurs to everyone who visits Hector is:

"What makes Hector the way it is?"

Why should this typical little farming town be so "un-typical" in its flying enthusiasm? "No one in Hector seems to have a definite answer for those questions. Even Mayor Smith, a jovial grey-haired man of 60 who is the town's No. 1 aviation booster, is at a loss for an explanation.

"Flying here just seemed to grow on the people in the last few years," he always replies when anyone puts these questions to him. "But I expect that the flying club had a lot to do with it."

The Mayor is not a pilot and has no intention of becoming one, but he describes himself as "just about the best passenger in town." The flying club, which undoubtedly has been the largest single factor in promoting Hector's aviation, has 20 members—all of them pilots. The club meets twice a month and every member comes to every meeting.

Five men who were so interested in aviation that they went together and rented 13½ acres of pasture land for a flying field, started the club two years ago. The charter members were Johnny Rice, Thorsten Olson, Glen Clark, Allen Kirkpatrick and Elwin Madsen. Rice and Kirkpatrick now are instructors in the Civilian Pilot Training Program at Rochester, Minn. Clark no longer belongs to the club but his son, Jimmy, 16, is the youngest member. Jimmy goes to high school and dreams of the day when he will be a commercial pilot.

The flying club was organized for the express purpose of operating the landing

Alfred Ericson, oldest Hector flyer, watches Theodore Garske gas ship.

Hector's mayor (second from right) and city councilmen plan airport expansion.

Mary Jane Leasman, 21, Hector's only feminine pilot, pretends to adjust engine.

field, but it since has branched out and participates with the Commercial club in a number of civic affairs. One of its recent projects was the sale of 500 automobile placards which read:

"Hector—Most Air-Minded City in U. S. A."

To join the club, an initiate must have at least two hours of dual flying instruction and must promise "to further the interests of aviation." A prospective club member must be sponsored by at least two members and must be approved by a majority vote.

The initiation fee is $2 and the dues are 60 cents monthly. Money from the club treasury is used in maintaining the airport. Most of it goes for mowing grass on the runways and for rent of the landing field.

Half of the landing field rent is paid by the club, the other half by the city. The 37½ acres have rented for $6 an acre yearly, but the city is arranging purchase of the present plot and adjoining land for an enlarged landing field. The mowing of the runways costs $14 for each job six times a year. In the winter the club members haul out a heavy roller to pack the snow, making take-offs and landings possible. One plane was equipped with skis last winter.

In addition to the initiation fees and dues, the club treasury benefits from the rental of hangar space on the field. The plane owners pay the club $2 for the hangar space if the ship is used only for pleasure and $4 a month if the ship is used for commercial purposes—instruction or carrying of passengers. Since all the planes but one are used commercially, the club makes $14 a month on the rentals.

Alfred Ericson is in the peculiar position of being the club's oldest member and one of its least experienced pilots. It might be said that a lightning bolt about a year ago knocked Ericson right into aviation. Until lightning struck and disabled his transmitter, Ericson was an enthusiastic amateur radio operator. Until the lightning came his way Ericson's friends—and that covers about everyone in town—had been unable to tear him away from his radio apparatus long enough to see what was going on at the airport.

"Then I took a look at an airplane," Ericson, a tall, angular grandfather, explained, "and I haven't had time since to fix that transmitter."

He said he took up aviation "mostly because I wanted to see if you could teach an old dog new tricks." Discovering that such was possible, he said, he regretted that he had not started earlier.

Ericson is the club's map-maker. He drew the plans for the proposed enlargement of the airport which will be completed if and when Mayor Smith and the city council can raise the necessary funds. The club recently sent copies of Ericson's map of the present airport to every other airport in Minnesota.

"When a fellow from another town landed here the other day," Ericson said, "he had one of those maps in his hand."

The club's only feminine member is Mary Jane Leasman, 21, who has been flying for more than three years. She also is a member of the Ninety-Nine club, society of the powder-puff pilots. After she was graduated from high school Miss Leasman, a pretty brunette, went to business college in Minneapolis and thus was lost to Hector's flying field for a time. Later she worked in the office of Gov. Harold E. Stassen at the state capitol in St. Paul, but she returned to Hector and resumed her flying about a year ago.

Although Miss Leasman is Hector's only woman pilot, she is only one of many women in the town who have a great interest in aviation. At least 50 per cent of the passengers taken up from the Hector airport are women, according to Carrington Fahlberg, the flying club secretary.

One of the flyers' most ardent fans is Mrs. T. C. Smith, 87-year-old mother of the mayor. She took her first airplane ride a few months ago and loved it. She chides the mayor because he has not learned to fly.

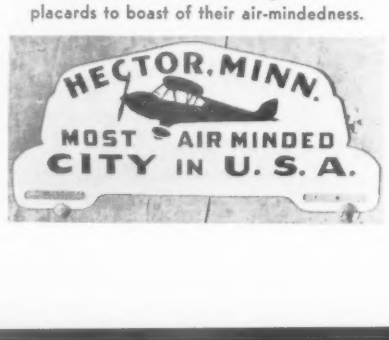
"I would go up every day if they would let me," she told the mayor recently. "I'll bet I could fly one of those things too." She goes to the airport every Sunday afternoon when the weather permits her "just to see those planes go up and come down."

A 78-year-old man took his first airplane ride recently and immediately tried to hire Johnny Rice to fly him to Florida. When Rice refused because of his passenger's advanced age, the old man said it showed that the youth of today lacks the pioneering spirit.

"If I ain't afraid to ride to Florida in that contraption," he muttered, "why should that young fellow be?"

The national defense program has put a temporary crimp in Hector's flying activity. All of Hector's instructors have accepted better paying jobs elsewhere. Johnny Rice, 26, and Allen Kirkpatrick, 22, both re-rated instructors, took jobs teaching college students to fly at Rochester. The field's other instructor accepted a teaching job at Hibbing, Minn. The departure of this last instructor, Vince Keltgen, 23, left Hector without a qualified flying teacher—a touchy situation for the nation's "most air-minded city."

Citizens of Hector have bought 500 car placards to boast of their air-mindedness.



Instruction is available at the Hector airport now only on Sundays when Lloyd Loucks flies out from Minneapolis. The students still flock to the field on Sundays, however, and Loucks is busy from the time he arrives early in the day until he leaves just before sundown.

Most of the planes at Hector's airport are second-hand ships costing from $800 to $1,400. Four of the planes are kept in T-shaped hangars on the field. The hangars—made of sheet metal with only a canvas flap across the front—were built by the plane owners at an average cost of $125 per hangar.

With only one exception, the owners finance their planes by carrying passengers or renting the ships for instruction purposes. Harold Berger, a farmer, has a 65 h. p. *Cub;* Allen Kirkpatrick and his father own a new Aeronca trainer; Otto Hagemeister, another farmer, has a *Cub;* Ormal Seeman owns a three-place Travel Air open biplane; and Lawrence Kirgis, another farmer, also has a *Cub.* Another plane will be added to the Hector fleet soon when Chester Anderson, who runs the "coffee bar," gets delivery on a new ship.

Anderson received his first flying thrills vicariously when the pilots started to drop in at his place for coffee or hamburgers. When he wasn't making a fresh pot of coffee or frying a hamburger Anderson listened to the pilots compare notes on the day's flying and swap yarns about planes and the men who fly them.

"I listened to so much flying talk—I decided to take lessons," Anderson explains. "The next thing I knew I was buying a ship."

Kirgis uses his plane to bring eggs into the Hector market from his farm 10 miles to the northwest. Sometimes he keeps right on going eastward until he reaches Minneapolis where he markets the eggs and does some shopping. Kirgis has no landing field at his farm, but he doesn't need one. "I just set her down in the alfalfa field," he explains.

Ormal Seeman sometimes flies out to his farm with tractor repairs. Torbert, the implement dealer, sometimes rents a plane to make calls on customers.

"Once a farmer called up and said he needed a new part for his binder right away," Torbert recalls. "So I loaded the stuff in a plane and it wasn't 15 minutes until I landed in the field right beside his rig. The farmer was plenty surprised but pleased with the quick service."

Dean of Hector flyers is Erwin Hable who, in 1928, was the first person in the town to buy an airplane. He used "just any old open field" as his airport, but it was not until the flying club was organized to provide a real landing field that

(*Continued on page 87*)

I LEARNED ABOUT FLYING FROM THAT!

—NO. 21

by Lieut. Robert L. Scott, Jr.

Few private flyers ever will be exposed to a mishap like that of this month's author-pilot. But military men should heed this warning carefully.

"FOR the ship is never landed 'til its wheels have ceased to roll." So goes the old moral which warns of the ground loop to the novice pilot and cautions even the oldest that merely because his wheels are on the ground he does not have time to stick his head down in the cockpit and light a cigarette. Another saying of this same type should admonish us that we should never hurry the inspection of the airplane prior to take-off. For just as the boxer is offering his chin when he leads with his right—so is the pilot sticking his neck out when he fails to make a personal check of his ship before the take-off. If you wish to grow old as a pilot—old enough to have that long white beard hanging down and getting in the way of the controls—then check and re-check your ship. Never take anyone's word that it has been done; never take it for granted that a check has been made and never forget that even the simplest mistake can cause the worst accident. Do your hurrying in the air but not on the ground. This includes the taxiing as well as the inspection of the ship. With practice the actual flying becomes almost as involuntary as a reflex action. It's as easy as dropping in. You just take that stick and "pull it back to take-off and then pull it back again to land." Although this simple formula technically will get a light ship up and down it does not mean that it will produce an accomplished pilot. Constant practice must follow and then a life-long course in the age-old school of experience which is common to all professions—we'll call it "profiteering by mistakes."

The overlooking of the slightest detail may contribute to the most serious accident. There sticks out in my memory the time when by hurrying and neglecting a small detail I came very close to disaster. Luckily for me and my mechanic it became a warning rather than a last act and I'm here to tell about it rather than to have it told about me. In this I failed personally to check my ship merely because it had been reported as warmed up and ready to go. Although it appeared to be ready for the take-off I did wrong in taking anyone's word for its fitness—I should personally have checked every detail. A few seconds of careful inspection and I probably would have avoided a very close call and a memorable "hair graying experience." As it turned out it taught me the value of thorough inspection of aicraft. The incident certainly "knocked my ears down" and more than likely saved me from some greater error later on. Be that as it may—after the wild episode was over I distinctly heard the Great Umpire of the Sky call, "Strike one." It certainly made me resolve to make it a long wait until I heard "Strike two."

It was summer in tropical Miami even though 1,200 miles to the northeast at our home station—Mitchel Field, Long Island—it was frigid February, 1934. We of the 99th Observation Squadron had completed our yearly gunnery practice at Chapman Field. All of us tanned by three weeks of balmy sunshine had heard daily reports from New York telling of more blizzards, deepening snow and sharper frostbite. Now with expert machine gunners made, we had received our flight orders to return to the home station. Consequently with front guns heavily cosmolined, rear guns oiled and canvas covered and gun sights removed, the nine Curtiss *Falcons* stood ready to go. Nine D-12 engines ticking over.

The date was the 13th but strangely enough—not Friday. I have often wondered why not. We were up before the sun for that three-stage hop from Miami to Mitchel. Nine O-1G's—cruising 120 m. p. h.—10 hours if we got the breaks with the winds and the three refueling stops at Jacksonville, Fort Bragg and Langley Field. My crew chief, Sergeant Tetu, reported all gear and baggage stored away and our ship—number 66—warmed up and ready. In summer flying clothes but with heavy winter equipment handy to facilitate getting into them when we left Jacksonville, we taxied out for the take-off. The nine of us were in single file and just as we turned into the westerly wind for the departure the first streak of sunrise reddened the waters of Biscayne Bay. Orders were to take-off in trail by single ships and to form right eschelon at 1,500 feet over the neighboring town of Coconut Grove. One by one the *Falcons* gunned away into the brisk wind with just enough interval to escape the worst of the prop-wash of the preced-

(*Continued on page* 78)

They Wanted Wings

A squadron of BC-1's taxies out to make flight scenes. Note Lockheed camera ship.

BY KURT RAND

Newest aviation movie to be released is "I Wanted Wings", based on the life of Army flyers. Herewith the story of its making.

Posed but authentic is this crash scene. Plane is a damaged BT-14 basic trainer.

DIRECTOR MITCHELL LEISEN, filming Paramount's "I Wanted Wings" at Randolph Field near San Antonio, Texas, changed his schedule suddenly one day, turned to his assistant, Arthur Jacobson.

"Get me Wayne Morris!" he ordered.

"Sorry," Jacobson replied. "Wayne's down at Stinson Field, flying a *Cub Cruiser.*"

"Then get me Donlevy."

"Donlevy's up with one of the Army pilots taking a few pictures of his own."

"Good night! Where's Ray Milland?"

"Learning to taxi a BT-14 over on 'A' stage," said Jacobson. Leisen shook his head in bewilderment. He finally settled for William Holden, Constance Moore and Veronica Lake, went into the business of getting another scene "into the can."

Oddly enough, "I Wanted Wings," a picture which will cost at least $1,500,000 before the cameras have turned for the last time, has a cast of flyers. Morris, at this writing, has about 45 hours on 2S equipment, is scheduled to come up for his private license within the next fortnight or so. Milland, with 300 hours, is taking "refresher" time with Ted Morton

Camera crew and director move in for a close-up of pilot and instructor in cockpit of trainer. Note Ray Milland.

The cameramen on this 50-foot platform are getting close-ups of plane flying at them.

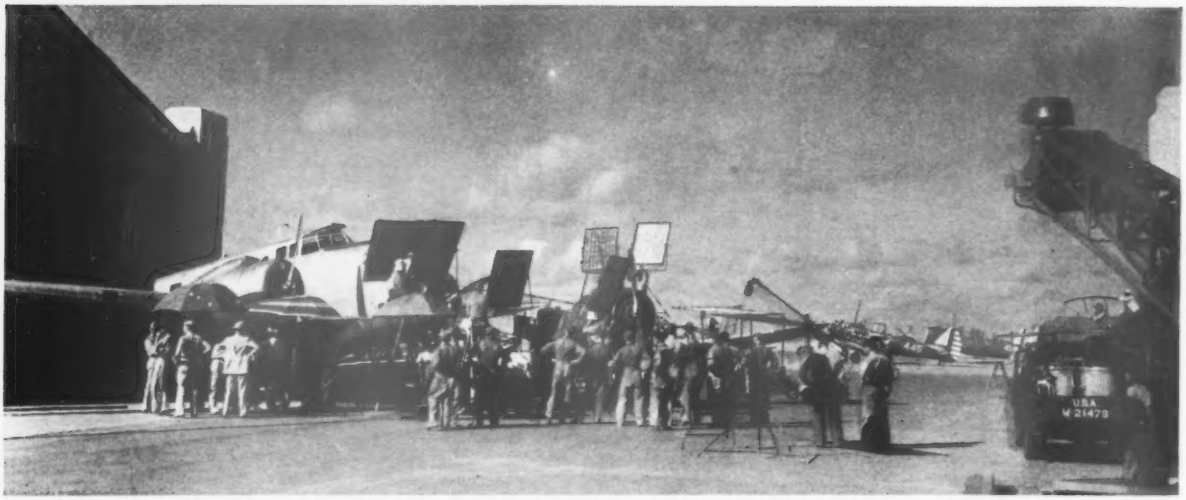
After hours of work in hot Texas sun, Actress Veronica Lake cools off in slipstream.

at the Los Angeles Municipal Airport. Brian Donlevy flew with the Air Corps during the World War. Leisen himself, although unlicensed, built up about 75 hours of solo time some five years ago. And in the cast are John Trent who, under the name of LaVerne Brown, was a TWA co-pilot; Archie Twitchell, character actor with about 150 hours, and several other qualified flyers.

Morris was the outstanding out-of-camera-range flyer on the trek to San Antonio for filming at both Randolph and Kelly Fields. With a lieutenant-instructor in the back cockpit he made several successful landings in a BT-9, a basic trainer.

The film, based on the successful autobiography by Lieut. Bierne Lay, Jr., Air Corps Reserve (inactive status) deals with the training and Randolph and Kelly and later maneuvers in which Lay took part. The picture uses the title and the background but reaches out for action, which includes the crashing and burning of a BT-14; the landing of the same type of ship in a "pocket handkerchief" field, and the crash of a *Flying Fortress*.

The most spectacular sequence deals with a "black out" of Los Angeles in connection with Air Corps maneuvers. The film tale has had a heavy injection of



Interested Army pilots and mechanics at Randolph Field watch movie crew shoot scene with bomber.

love interest, of course, the lives of two girls having been woven into the plot. There's even a "hot song," introduced by Miss Lake at a replica of a San Antonio roof garden.

From the standpoint of flyers, the chief interest will lie in correct technical detail. This is very nearly assured through the work of Lieutenant Lay, who acted as technical adviser; and Lieutenant William P. Nuckols, public relations officer at Randolph Field, who acted as liaison officer. The picture could not have been made without the full cooperation of the War Department, which was interpreted by commanding officers of Randolph and Kelly Fields, Brig.-Gen. Rush B. Lincoln at March Field and Brig.-Gen. Millard O. Harmon, commander of the Gulf Coast Training Center as meaning that Paramount was to have (1) full permission to film at any and all places on any field designated; (2) use of planes and facilities of all kinds; and (3) use of personnel in scenes in the picture.

Spectacular flying was done for many of the shots by Capt. Thomas DuBose and Lieutenant Fred Gray. Three North American BC-1's were loaned by Hamilton Field for a series of low-flying maneuvers in the vicinity of Fresno which, in the picture, end with the fatal crash of Wayne Morris just before graduation at Kelly Field.

Paramount production men who have been working on actual filming for four months, set forth that more than $25,000,000 worth of equipment, from training planes to the huge Boeing B-17's, are seen in the production. From this standpoint "I Wanted Wings" will show more airplanes than any other film ever produced—including such epics as "Wings," "Hell's Angels," and "Dawn Patrol."

The picture is strictly not propaganda. Very definitely, in photographing barracks, training routine, mess halls, class rooms and social life it tends to show that the life of a flying cadet is very interesting—which it is—and at the same time concedes that it is a little more dangerous than just lying in bed, for instance.

The flying scenes are spectacular. This is due to the flying of DuBose, Gray and many other pilots and the photographic work of Paul Mantz, veteran Hollywood stunt pilot, and Elmer Dyer, the aerial photographer. Mantz flew a low-winged

(*Continued on page* 84)

Having bailed out of his disabled plane, Star Wayne Morris contemplates some old-fashioned farm cooking. He is telephoning for Army salvage truck to get wrecked ship.

William Holden (left) portrays a flying cadet, Brian Donlevy an Army instructor.

PASSENGER HAVEN

by

DONALD O. HERTY

The world's first all-air passenger terminal is nearing completion in New York. But overflow crowds already are anticipated.

Most startling feature of the Airlines Terminal is its entrance and huge map.

NOT long ago the 105 x 200-foot ditch across the street from Grand Central Station in New York City was enclosed by a wooden fence riddled with peepholes, around which crowded hundreds of people, members of the Knot-Hole Club. So many New Yorkers exhibited a lively interest in the construction work on busy 42nd street that the managers of the building formed them into a club for kibitzers.

But now the kibitzers have no excavating to watch, for the Knot-Hole Club has been replaced with a chromium and marble building, through which 1,000,000 air travelers will pass during 1941. This is the long-awaited Airlines Terminal.

Rearing its ultra-modern head six stories above the street, the new structure replaces the individual airline ticket offices that formerly dotted New York's Grand Central district. It's the newest office building in the Big Town and the only one of its kind in the world. Henceforth passengers leaving from or arriving in New York by air have a terminal in the heart of the city's business district. It is the firm conviction of airline officials that this is the answer to their prayers for service to New York's downtown.

Formerly, air passengers who desired to use the limousine service from the city to the airport had a choice of eight ticket offices and varying elapsed times to keep straight in his mind. Now the city ticket offices of the six New York lines have been merged into one structure. No matter what one's destination may be—it can range from New Orleans to Minneapolis, from Guam to Lisbon, from Boston to San Francisco—he need merely step into the Airlines Terminal and his worries are over.

This new focal point of air transport impudently blinks an amber and green beacon at its rival, Grand Central Station, by night and by day steals an idea from Grand Central in the newsreel theater which occupies the westernmost end of the airline center, facing 42nd street.

The building itself is as modern as the purpose for which it was erected. It is the only all welded-steel structure in New York. The exterior is of conventional Indiana limestone, but the main entrance of the building is the most startling of its features. It is a three-story convex map of the world done in colored stainless steel shining from a black background. The doors are glass and gold and the escalator leading to the main floor chromium. Throughout the lobbies and public rooms this modern contrast of bright metal and clear glass is carried out in all the decorative schemes. No neon lights, no painted signs, no commercialism.

The Airlines Terminal includes waiting rooms, public telephones, wire services and coach dispatching facilities. The latter controls all airport coach movements.

In the main lobby, which is 150 feet long and 50 feet wide, ticket counters line the sides. Although this building is intended to serve the airlines for many years to come, it is worth noting that there is no space for expansion. Like the administration building at La Guardia field, the Terminal was designed before the airlines had cause to hope for the tremendous upsurge in business which they have experienced during 1940 and expect to continue through the next decade, as fast as they can buy equipment.

Throughout, the Airlines Terminal is a maze of mechanical conveniences undreamed of a few years ago when the airlines were struggling to support their old offices. Here are pneumatic tubes, elevators that lift passenger coaches from the third basement to street level, a conveyor belt to carry baggage, elevators for luggage only, escalators for passengers and a road within the building down which limousines circle to deposit inbound loads in the first basement and continue to the third to catch the up-elevators. A restaurant, a bar, a quick lunch counter and a newsreel theater are on the premises. There are a waiting room, public telephones, wire services, an information counter and a cage from which the coach dispatcher controls his arrivals and departures. In short, the airline officials who drew up the specifications for this terminal incorporated in it all those facilities that had heretofore been lacking from their city offices.

One reason for the length of time it took to build the terminal after the plans had been made was the rapid growth of the industry itself. Originally it was planned to operate all coaches entering and leaving the building on elevators. Later it became apparent that this would double the work of the elevators and cut in half the number of coach departures. So a ramp for inbound limousines was constructed, leaving the six "levelators" for outbound cars only. Maximum number of departures an hour is estimated optimistically at 72, figuring one coach every five minutes for each elevator. Last summer, loads during peak periods of busy days exceeded the capacity of the elevators and some airline men believe that coach facilities will be inadequate from the beginning of operations.

Other difficulties are foreseen in steering passengers to the correct coaches. At times six will be loading at once for departures to the airport. With flights on different airlines scheduled to depart within minutes of one another, it is quite possible passengers boarding the wrong coaches will miss their planes. Knowing from previous experience that paper plans are never foolproof, the executives are requesting "heads up" handling from their employes and trusting to their good judgment to work out kinks expected in the first months' operations.

The existence of this consolidated airline terminal is the outgrowth of a happy coincidence. The space it occupies formerly supported New York's old Belmont Hotel which went out of business in 1932. Assessed at $3,000,000, the idle land was an expensive headache to its owners, the Mutual Life Insurance Company. In the six years following demolition of the Belmont, only a beer garden and a flower shop had used the plot, but these enterprises were hardly in keeping with the tremendous value of the property. Mutual was consequently searching New York for a suitable use for the land.

The airlines, which in the early days of scheduled transportation had had a consolidated ticket office in the Roosevelt Hotel, were considering a return to the "union terminal" idea because of the ultimate economy and convenience it would enable. But it was Floyd DeL. Brown, president of the Bethlehem Engineering Corporation, who recognized the relationship between the airlines' vague dream and Mutual's urgent need.

"Some time early in October, 1937," recalls John B. Peterkin, the Terminal architect, "I got a telephone call late at night. It was Mr. Brown. He was excited. He told me that he had found the perfect solution to the old Belmont site. Now bear in mind that that site was extremely valuable, that there was a depression, and every architect and builder in New York had attempted to draw plans for a structure there that would be suitable for the location and prove financially worthwhile for the owner."

Together Brown and Peterkin contacted airline executives. They got the immediate support of John B. Carey, vice-president of the Grand Central Cadillac Renting Corporation, which operates the limousines. The airline men were du-

(*Continued on page 76*)

Actual airline passengers will be concerned only with the new building's first two floors. Other space will be devoted to airline offices, shops and a newsreel theater.

SMART SERGEANT

by Alexander McSurely

The Army Air Corps usually doesn't make a fuss over its officers, much less an enlisted man. But Sergeant Ralph Gray is not just an ordinary Army technician.

REMEMBER how grandmother used to bake those swell pies? She put in a pinch of this and a handful of that and threw it all together without any seeming method and then stuck the result in the oven. Apparently she forgot all about it until just the right moment when she opened the oven door and there it was nicely browned.

To a casual observer's eye, that is the same method Technical Sergeant Ralph Gray of Wright Field, Dayton, O., used in building his new hydraulic fuel system about which Air Corps heads are more than a little jubilant. Behind grandmother's apparent lack of method was her experience born of long association with flour and salt and the other ingredients that good little pies are made of. She knew what her old range could do, too. And following the same parallel, Sergeant Gray's new fuel system has behind it his expert mechanic's skill and his long experience with aircraft engines.

He is no engineer and he does not claim to be. But he is an expert with tools; he has ideas and he has the skill to reproduce his ideas in metals. And one thing more—the dogged perseverance to work steadily through long hours of overtime until he achieves success.

The final result of those long hours over a five-year period of trial and error is a new hydraulic system which the War Department believes will give American airplanes an important advantage over the warplanes of other great powers. Its chief merit lies in the fact that it will maintain constant fuel pressure for airplane engines regardless of altitude. Up until the time that Sergeant Gray and his idea came along there was a bugaboo of all high altitude flight known as "vapor lock." That is the tendency of high test gasoline to vaporize under the lighter pressure of thin high altitude air. When it happens the fuel line is stopped as effectively as if somebody stuck a hunk of mud in it. Your engine spits and quits cold.

But now with the new Gray fuel system, the most essential part of which is a regulator which maintains a constant pressure in the fuel line regardless of what the outside atmospheric pressure may be, the Air Corps believes it has vapor lock licked to a faretheewell. So valuable is the new system regarded that its installation has been ordered on many of the planes now in production for the Air Corps expansion program. The system is too good for story material. Wright Field engineers and Sergeant Gray are under orders to keep quiet about the secret behind the new system—the certain something in the mechanism which makes it a success where other hydraulic fuel systems have failed in high altitudes. One of the last things Secretary of War Harry Woodring did before his resignation was to write a personal letter of commendation to Sergeant Gray. Coming from the head of the War Department to a lowly non-com, that is something very rare indeed.

U. S. ARMY

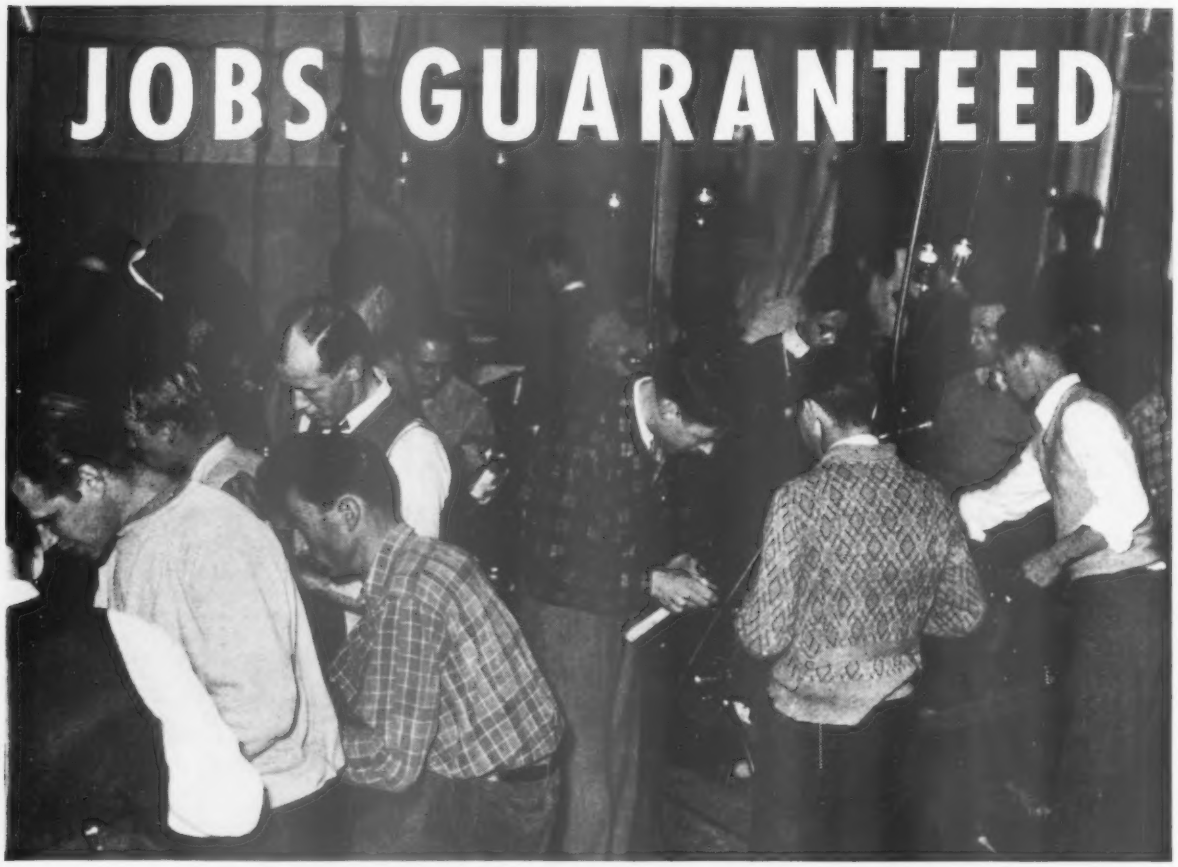
Sergeant Gray is stationed at Wright Field.

If more cannot be told about the fuel system more can be said about the quiet, unassuming man who developed it. His qualifications include a high school education and the Air Corps mechanics' course at the Technical School at Chanute Field, Ill.—that and nothing more.

Born at Sun Dance, Wyo., February 4, 1900, he was raised in Kansas where he enlisted at Fort Riley in 1919. He joined the motor transport corps and within six weeks was advanced to the rank of sergeant. He dropped out of the Army for a few months after the expiration of his first enlistment, but went back, again at Fort Riley, in December, 1921, this time in the Air Corps and retaining his sergeancy. Again in 1927 he left the Army to operate a trucking business at Portland, Ore., for two years, but in March, 1929, he came back to Fort Riley and re-enlisted. The following year he went to Chanute Field for his machinist's course and then he was transferred to Langley Field, Va.

Not long after he went to Langley Field he was advanced to shop foreman in recognition of his mechanical ability. It was

(*Continued on page 79*)



Vought-Sikorsky paid $30,000 for the Bridgeport school's equipment. Operation cost is $8,000 monthly.

JOBS GUARANTEED

by JOHN H. PINKERMAN

Photographs by James P. Schwartz

One major aircraft manufacturer has taken the labor-shortage problem into its own hands, training skilled workers wholesale.

THE alarming shortage of skilled aircraft workers—one of the conditions which must be overcome to speed up the nation's national defense program—is being solved quickly and satisfactorily at the Vought-Sikorsky Aircraft Co. factory in Stratford, Conn.

The difficulty experienced by airplane manufacturers in filling their shops with expert workers seemed on the verge of creating a serious bottleneck in the industry's progress, but in the town of Stratford (population 22,184), Vought-Sikorsky is in the midst of converting 2,000 greenhorns into capable and trusted aircraft workmen.

Months after the Connecticut experiment had proved its worth, Republic, on nearby Long Island, undertook a similar training program. Republic's immediate project was on a larger scale than that supplying trained young men to the Connecticut factory, but Connecticut's several-month headstart provided a decided edge on results accomplished.

The Vought-Sikorsky program is unique in that it is one of the first in the United States to operate with the cooperation of the state trade schools. In fact the trade school in nearby Bridgeport, Connecticut's industrial center, was so eager to cooperate that officials, with but a few days notice, cleared one of its own masonry classrooms to make room for aircraft riveting.

In operation slightly more than six months, the training course has more than justified its expense to the company. About 300 men have "graduated" from the 12-week school to jobs in the shop. Only one has been discharged for incompetence. Many have won rapid promotion.

The Vought-Sikorsky Company purchased all equipment for the school at a cost of approximately $30,000. Operation cost is $8,000 per month. This bill is shared by the National Defense Emergency fund. The figures seem high but, as one administrative head pointed out, two simple facts justify the outlay. First, production schedules at the plant leave no time for anything in the way of instruction for inexperienced help. Second, one faulty operation by an unskilled hand can ruin $20,000 worth of airplane construction. Thus the assurance that every man in the plant's force of nearly 6,000 has at least an elementary knowledge of his particular task, pays dividends.

Successful from the point of view of employer, the training school has been equally successful in the eyes of employes, both those who received training and those who were employed before the school was opened. The school graduates, unemployed when they entered the course, are assured of jobs at the factory on completion of their prescribed work—provided, of course, that they finish satisfactorily. Employes who were at the plant prior to the school's opening have been aroused by the progress of their new fellow workers and have demanded night courses to improve their own skills.

In response the company has authorized night classes, three nights weekly, in engineering, blueprint reading, and mathematics and general shop advancement. There already are three times as

These students are working in the hand sheet metal class of the Vought-Sikorsky school. The courses last about 12 weeks. Plans call for 2,000 men to be trained.

many applicants for the evening classes as can be accommodated.

But let's get back to the day classes and something about their history. About March, 1940, the need for skilled airplane workers began to be manifest. The factory employment lists had jumped from 400 to 2,400 in less than a year—due partly to the consolidation of the Sikorsky and Chance-Vought divisions of the United Aircraft Corporation and partly because of authorized and anticipated U. S. Navy contracts. Chance-Vought had been located in East Hartford, Conn., the home of Pratt & Whitney and Hamilton Standard, engine and propeller divisions of the United Aircraft; but moved to Stratford with the consolidation. At that time additions were built to the Stratford factory to provide 450,000 square feet of floor space. Another addition, providing 184,000 square feet, now is in construction.

As company officials met to confer on the need for more skilled workmen they were presented with facts showing hundreds of job applicants at the employment office each week—but none in the long line of applicants at the plant office could point to airplane experience. The experienced men had already been absorbed.

While the study of a possible solution to the problem was in progress, Vought-Sikorsky experienced a change in management. United Aircraft directors replaced the general manager, factory superintendent and other key executives. The new management, instead of sidetracking the study of employment, plunged into it and received authorization to undertake some type of job training scheme. The orders were: "Find some way to train 2,000 men."

The usual red tape followed but, on May 2, a conference was held with officials of the Bridgeport State Trade school. A cooperative plan was definitely decided upon at this meeting. Four days later the trade school furnished study courses for approval by factory executives. On May 13, exactly 11 days after the idea was born, there were 32 trainees at the school beginning the 12-weeks course.

Instructors were at that time—and still are—selected from the ranking foremen of the factory. Officials decided that the factory foremen were best qualified to teach prospective employes the type of work desired. Instructors' salaries are paid by the state.

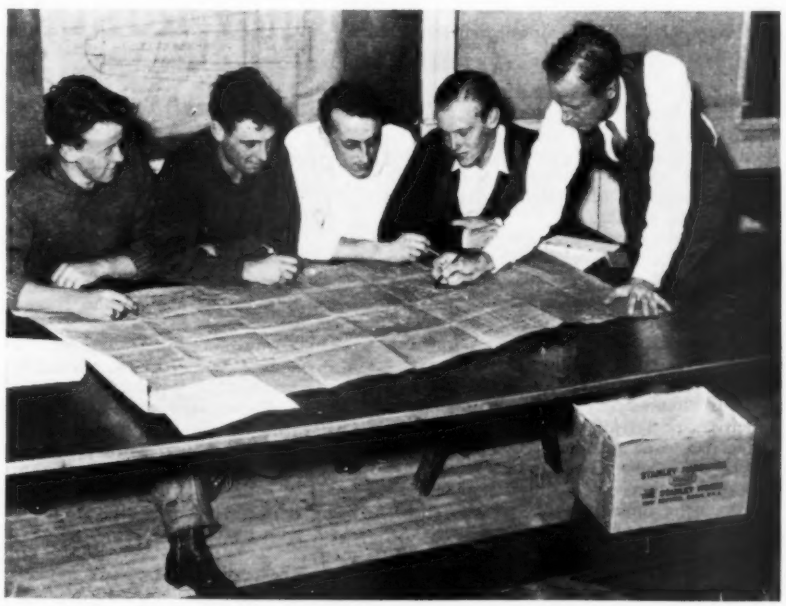
Riveting and sheet metal working equipment was installed in the one room at the trade school assigned for the course. The one room soon proved inadequate, the group of 32 increasing to 50 in less than two weeks.

More rooms were turned over to the classes at the trade school on July 29 when the program included 150 students and 12 instructors. Progress was so rapid and the plant's need for men so great that class leaders were taken ahead of schedule and placed in jobs as helpers at the factory, sometimes after only eight weeks of training.

The need for men became more acute daily. Finally, on September 30, eight unused rooms in a Bridgeport city school house were turned over to the course. Enrollment immediately jumped to the 300 with trainees leaving daily for jobs and new applicants arriving to begin their study of fundamentals of aircraft work. Plant officials have made no definite rules regarding ages of students in the classes. They prefer youths between the ages of 18 and 20, declaring that response to instruction is best in that bracket. There also are students who are in their late forties. With no pay envelopes during the training period, the classes for the most part comprise young men without dependents.

The machinery controlling the selection of trainees operates carefully but without waste motion—the need for speed being too urgent to permit that. Careful study has produced a system that works simply, quickly and effectively.

(*Continued on page 74*)



Students in a blueprint class study the plans of the old Sikorsky S-42 airliner.

Night BOMBARDMENT

U. S. ARMY

Every detail common to a good daylight picture is evident in this flash view of Rochester, N. Y. Note bomb reflection.

by ROBERT S. JOHANSON

The newest weapon of the Army Air Corps shoots pictures instead of bullets. Much of the credit belongs to hard-working Maj. George W. Goddard.

THE U. S. Army is proud possessor of a new, secret weapon destined to influence the course of aerial warfare. Its vital details closely guarded, the device just has been demonstrated publicly, to the amazement of civilians and delight of military officers.

The new weapon is a magnesium photographic "flash bomb." Although in the process of development for years, it now has been brought to a stage that permits the taking of aerial pictures at night with daylight accuracy. Using no parachute and operating in conjunction with a specially synchronized aerial camera, the "bomb" makes possible exceedingly clear pictures of terrain, bridges, troops, emplacements, camps and other military objects—from several thousand feet up.

Examination of the flare's operation reveals the import of this weapon which kills darkness. Major tests, made recently in Rochester, N. Y., with the co-operation of the Eastman Company, disclose the value of this weapon which often will be at least as important in warfare—and perhaps more valuable—than mere explosives.

The Army officer mostly responsible is Maj. George W. Goddard, photographic research chief at Wright Field, Dayton, O. A 51-year-old former Rochester newspaper cartoonist, the major saw his years of research and work reach a new peak of success at Rochester. When the tests were finished, when Rochester had been "bombed" repeatedly, Major Goddard, with pardonable exuberance, commented:

"I forecast this will mark the end of the day when military leaders prayed for darkness or for a few extra hours of daylight."

To understand the workings of this flare bomb, it is necessary to explain its effects, its history, its construction—as far as Uncle Sam will permit—and, finally, its significance. . . .

High in the night sky drones a Douglas B-18A bomber. A city twinkles far below—Rochester, an American community at peace which soon will witness far-reaching tests. Only a dull moon slides from behind soft clouds. The B-18A keeps circling for altitude. Suddenly, at 9:30 p. m., blinding light splits the heavens. A tremendous blast startles resi-

— WITH A *Camera*

Major Goddard (left) and Lieutenant Cooper are holding the special aerial camera used in new system.

dents. The city's streets are fleetingly brilliant. Concussion rattles windows. Just as suddenly, blackness again shrouds everything except the city's own myriad lights. On thunders the bomber. Again —a flash. Again a huge clap as though lightning had struck with a hundred mighty bolts. Once more, that blinding brilliance.

Little do street-gawking laymen, impressed with the spectacular effects of the Army's "game," realize the potential military value of this demonstration. But it is a revelation of the light that generals have prayed for through generations of wars; an example of a means of shooting night aerial pictures, of discovering enemy movements and positions, of gaining that all-important "first knowledge." For this flare, in Major Goddard's words, gives light "about equivalent to that of the sun at the horizon—or sunset."

What, then, is this non-destructive flare bomb of which Army officers are so proud? After the pilot of the B-18A, Lieut. Marcus Cooper, brings the ship down, we study the flare and hear Major Goddard describe it. For, though kept in comparative secrecy, the flare bomb is not wholly mysterious. Its operation is outwardly public; only its components and exact performance figures are withheld.

When the flash bomb explodes undisclosed millions of candlepower flash, for about a sixth of a second. In this fraction of time an automatic aerial camera functions. In the next few minutes men in the plane can develop the picture and drop the prints to officers below. This gives the command an exact idea of the battle or operations scene.

The camera itself is not especially complicated. It is in a vertical suspension mount for shooting down from the plane's floor. It has a photo-electric cell and electric control apparatus for synchronization. Giving an 8x10-inch negative, the camera is operated by the photo-electric cell. When the flare bursts, the cell picks up the flash and sends an impulse to the control box which, in turn, boosts the current up to a point sufficient to trip the shutter. That is the fundamental principle of the device.

Main point of this new method of night observation is the flare itself. Major Goddard says: "There have been times in the history of the world when an hour or more of daylight would have changed the tide of battle which, in turn, would have influenced the sweep of history. Now we have that 'daylight.' It's in this light bomb. We can take pictures of troop movements, of harbor and railroad activities previously shielded by nightfall. We can check the results of bombs dropped during daylight." Eastman Kodak Company scientists who have cooperated with the major back up his statements.

What procedure does the Army follow? Into the bomber climb Major Goddard and Lieutenant Cooper. As the ship takes off Major Goddard, inside, readies his flying laboratory. Only the plane's red, green and white lights gleam like pin points to ground observers as the bomber climbs to 5,000 feet. Lieutenant Cooper, formerly with United Air Lines, heads the bomber over the area selected for the experiment. Then, in position, the ship drops a flash bomb. Down it hurtles past the tail. It bursts and an ap-

This is the Douglas B-18A bomber used in Rochester night flash photography flights.

Above are flash bombs used in photography.

proximate five-mile diameter alights for a fraction of a second.

In that instant, however, the camera's photo-electric cell flicks the shutter. The picture snaps through and the camera is immediately ready for the next flare's impulse. The shutter trips at the peak of the flash, about one-5,000th of a second after the explosion. The flares, cylindrical objects resembling a giant 40- or 50-pound firecracker, are constructed so they will not explode upon impact with the ground should they prove to be a photographic dud.

A highly important aspect of the flare is that its flash is so blinding that it conceals the position of the reconnaissance plane from ground batteries. This, obviously will aid nightly forays over enemy lines, affording comparative safety to the plane crews. It will bring another element of surprise into modern air warfare.

Major Goddard began work on a flare in Rochester in 1925 and took his first pictures with the precursor of the present flare in 1926. Since then he has continued his experiments; has visited Rochester from time to time and has conducted other experiments in Dayton. His success represents the ultimate in flare development. Officers remember the "flying torpedo" or small glider of 15 years ago which carried 60 pounds of the explosive, was pulled by a plane and allowed to explode behind the plane. The obvious danger cancelled this plan. Another flare-bombing attempt was made with flares composed of 50- and 75-pound charges of ordinary flash powder. This bomb also was dangerous and unsatisfactory because of weight and poor lighting stability and presence of flicker.

After considerable work with laboratory scientists in private companies, the Army now has produced its latest, most successful flash bomb. It is highly satisfactory and requires few—if any—refinements. It is safe, bright and operates easily. Though touted in some press reports as a "billion-candlepower flare," it probably generates less than that, research men believe. Best evidence of its power is the photograph accompanying this article —and Major Goddard's statement that it is equal to sunset light. However, exact power of the flare is a military secret.

How do military observers view this "latest thing"? What is its significance? A bit of background is in order. Today's warfare stresses air power to the utmost. National defense plans for the United States, likewise emphasizing air fleets, have been accompanied with an equally great amount of observation work. With accurate knowledge of enemy positions, it is obviously exceedingly difficult and at times impossible for pilots to drop their bombs with greatest accuracy. English bombers, for example, often have been instructed to return to their bases and drop their bombs into the sea if they have been unable to locate the definite objective sought.

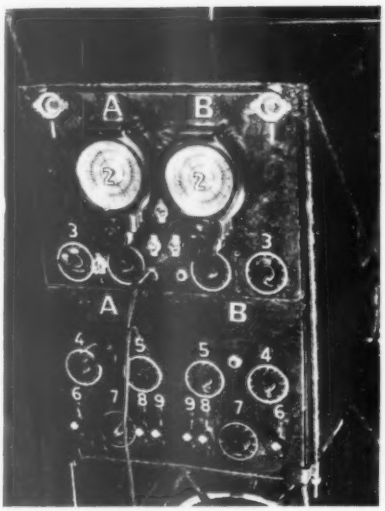
It is photo-spotting—the exact picturing of targets—which the U. S. Army now is bringing to an hitherto unheard-of preciseness. Flares, of course, are no new military development. Reports from London and Berlin tell of their use in both Nazi and R.A.F. reconnaissance and attacks. Usually—probably invariably—they have been parachute flares. But these are "small fry" compared to Uncle Sam's new weapon. Also, parachute flares tend to show up the attacking plane.

Even oblique pictures are successful with the aid of the new flare. Major Goddard, for example, flew over a Lake Ontario harbor one night during his Rochester experiments and returned with satisfactory photos of the military objective. Daylight reconnaissance, in contrast to the methods possible with this aerial flashlight, often has proven to be a mission accomplished at frightful loss, if at all. Interceptor fighters and anti-aircraft batteries can shoot down observers or swerve them from their course.

(*Continued on page* 89)

Below is one type of night aerial camera equipment, disassembled and with its case.

FAIRCHILD



On experimental models of the Harvey device, controls were crude and exposed.

HOMER

by HAROLD MARQUIS

Here is the latest version of a radio homing device—with a few new additions. Perhaps this development will make radio navigation as foolproof as pilots have been hoping for.

FOR years, airmen have wanted to fly a straight line from point to point. But, only in exceptional conditions that are beyond human control, has this previously been possible. Recently there was demonstrated to a few Army and Navy officials and airline executives a directional automatic radio control.

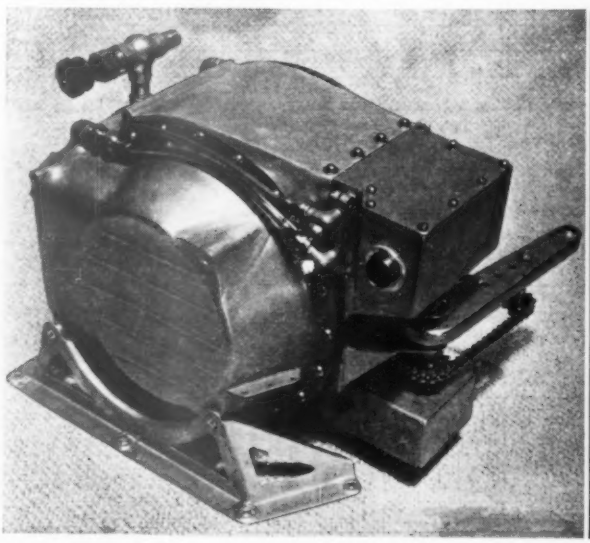
This is a completely new type of radio control. It draws figurative white traffic lines in the sky, then holds the plane on those lines without any more help from the pilot than flipping a couple of buttons. Behind this new development are years of experimentation. Ahead appear almost unlimited possibilities for increased safety and efficiency in our rapidly growing air traffic.

Radio homing devices aren't new, of course. They've been in use for years, and are standard on all the air transports. One type simply indicates whether the plane is headed toward a given point and requires the pilot to exercise constant control to hold his course. Another type is combined with an automatic pilot, which operates the rudder to hold the nose of the ship toward the radio transmitter. All that any homing device has been able to do is hold the nose of the plane toward the sending station. In any cross-wind the ship describes an arc and may end up approaching the station from a direction entirely different from that first taken. In the extreme case of a whirlwind, the plane might completely circle the transmitter, its nose always pointing toward the station. It is not uncommon for a plane to be blown many miles off course, possibly into dangerous territory.

The new control, developed in Los Angeles by the Harvey Machine Company and demonstrated by Pilot Frank Wallace, has two radio receivers. Two radio stations are chosen that are on the proposed line of flight and each receiving set is tuned to one of these stations. The signals are mixed in the control that operates the automatic pilot so that the plane is held in an absolute straight line, regardless of cross-winds or other outside conditions. To make this possible, the plane will often fly up-wind, or "crab," at an angle to the true course, but the body of the ship exactly follows the imaginary white line.

Frank Wallace believes in testing, not talking, but finally admitted the new control was ready and a date was arranged to fly from Long Beach. His big Stinson looks like an electrical laboratory, so he explained that the instruments were in

This vacuum servo motor is actuated automatically by the radio signals, keeps plane straight by operating rudder.



Below is instrument panel now used, showing how two radio stations are dialed and simple method of selecting course.

the freight compartment instead of under the instrument board only to make them easier to see. To a layman, the outfit looks like an oversized battery set with an unintelligible set of control knobs and pointers. The demonstration, however, was more than clear.

"Here's what we'll do," Wallace said, before we took off. "We'll fly to KFI and then you watch this map till we get to KNX." He had a big detail map with a straight line between the two stations. Practically every bridge, oil refinery and clump of trees along the course was clearly marked.

It was a good day for the test for there was plenty of wind, but visibility was unlimited, so we had to imagine the fog to make the problem complete. We took off and Wallace flipped a dial and said we were on the automatic pilot tuned to KFI. Pretty soon the plane started doing nice, tight figure eights and, sure enough, there were the radio towers. Every time we crossed the station we split the towers as accurately as a surveyor.

Then the pilot flipped a couple of dials that said "from" and "to" and told us to start checking the map. We flew so close to the course that he had to dip a wing to let us see the landmarks. No geometry instructor ever drew a more accurate "straight line between two given points."

"Keep an eye on this dial," Wallace yelled over the engine noise and finally managed the explanation that it registered the degrees we varied off course. Two little pointers were flickering a little, but neither one ever got past the one-degree mark. One green and one red eye kept winking at us near the top of the bank of cockpit instruments. We finally figured out that they showed which way the rudder was being turned—back and forth for fractional seconds to hold the plane dead on the line.

We flew over KNX and did some more neat criss-cross then, with the automatic controls off, headed for a point about half-way between stations but several miles off the line. "We're lost in the fog," Wallace said, "and we want to get back on course." He tuned the two dials to KFI and KNX, flipped the controls to a 90° reading and around we went, exactly at right angles to the original course we had followed. Then he turned one station to "from" and the other to "to," and we turned to head right down the line again toward our starting point.

Any course can be flown, with two stations ahead, behind, ahead or behind, or at right angles. By lining up two transmitters at the field, blind landings on a 50-foot runway are possible. Commercial stations are not necessary as the radio also picks up weather signals, beams and the inaudible signals the radio engineer calls "unmodulated."

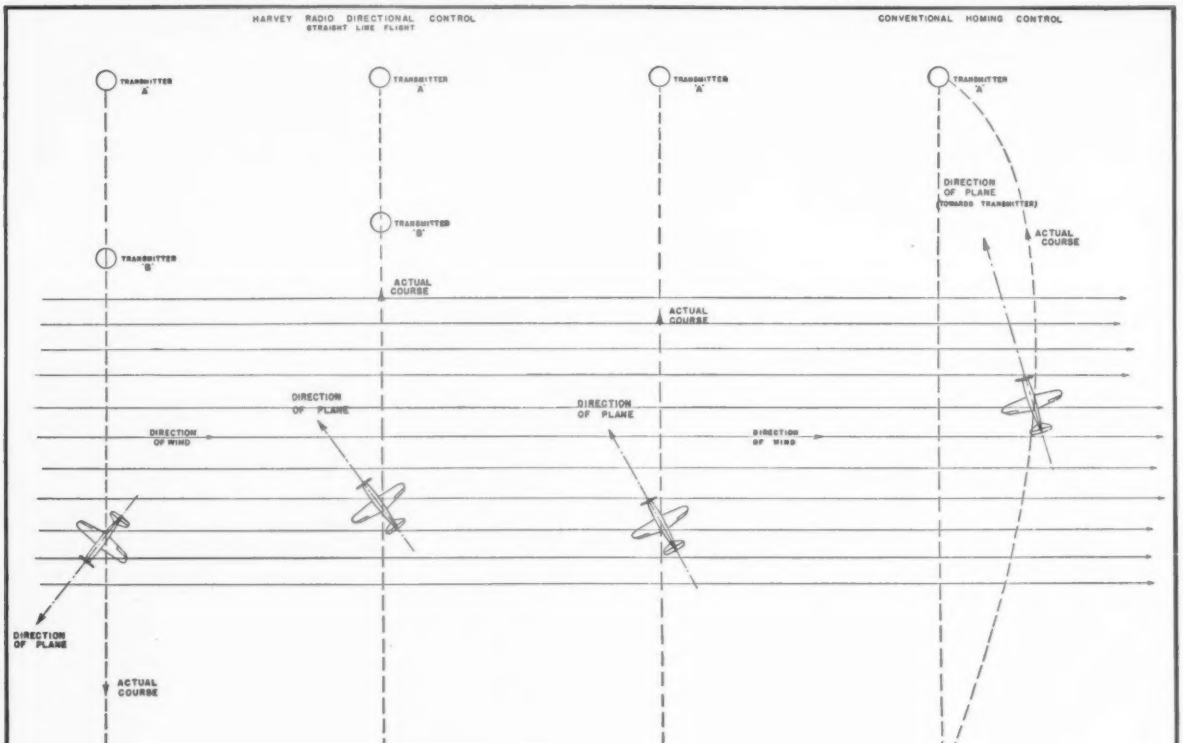
"Suppose we want to send a bomber over a ship in a known position," Wallace explains. "All we have to do is line up a couple of portable, field transmitters on the proposed course, tune your receivers to the 'from' position and away you go. Get to the objective, drop your load, switch the receivers to 'to' and you're on a perfectly straight line back home again."

Another unique feature of the Harvey control is what its inventors call a proportionating device. Ordinarily, with either manual or automatic pilot control, the rudder action throws the airplane across its course and it must be pulled back again, constantly criss-crossing or "hunting." This is eliminated by an automatic volume control in the two radio receivers, by which the amplification of the receiver is inversely proportional to the signal strength. Thus, a plane 10° off course receives twice the rudder action as one 5° off course. As the airplane approaches its course the rudder action is decreased until the ship flies straight ahead.

As explained, the signals from two stations are proportionately mixed in the receiving set. This combined signal then actuates the vacuum servo motor, which is the operating control of the automatic pilot. This motor deflects the rudder exactly the right amount to right or left to hold the plane on its straight-line course. Refinements in the original models have brought the weight of this complete equipment down to about 60 pounds or approximately two-thirds that of conventional radio equipment.

END

Diagrams below illustrate difference between Harvey device and homing radio equipment now being used.



Mlle. Instructor

Helen Harrison has flown in the U. S., South Africa, Britain and Canada.

by A. D. STUEBING

It isn't often one finds an attractive young lady teaching military pilots to fly. Miss Helen Harrison, though, has soloed many Canadian pilots

"HARRISON you want? That's her up there in 209."

The reporter glanced skywards where a bright yellow Fleet was cannonading down in a tight spin. "That can't be her," he said. "That's an Air Force plane."

"Sure it is. And she's teaching a p.o.p. (provisional pilot officer in the Royal Canadian Air Force) his aerobatics," the hangar mechanic replied.

When the plane side slipped in and was idling in place on the line, two figures were visible in the cockpit. First to bound out was a slim boyish figure, who once on the ground brushed off her helmet and shook out her hair. It was Helen M. Harrison coming in from a sortie in the clouds where she had been teaching an R.C.A.F. student the rudiments of military flying. The only woman engaged in teaching enlisted airmen in Canada to fly, Miss Harrison was second instructress at the Kitchener-Waterloo Flying Club, near Kitchener, Ontario, Canada, assisting Chief Instructor Harvey McPherson in preparing the Dominion's fledglings for battle.

Miss Harrison has since severed her connection with the flying club in an attempt to get a job either ferrying warplanes from factories to Air Force training centers or instructing pilots at one of the British Commonwealth Air Training Plan training fields. She also is trying, with more than 2,000 flying hours to her credit, to join forces with the English and Canadian veteran pilots who are ferrying American-made warplanes across the Atlantic to the Royal Air Force. "There's hardly any hope for that however," she said wryly. "They don't seem to want women in this war."

At the K-W Flying Club, Instructors McPherson and Harrison were turning out five R.C.A.F. students every two months. But if she is accepted at one of the 18 air training centers under the Commonwealth Air Training Plan she will be assisting in training 24 pilots every month.

Canada's only woman instructor of military students and believed to be the only woman in the world engaged in such work is entirely feminine in spite of her position which most people regard as purely a man's job. With 10 of her R.C.A.F. students already on active service "somewhere in England and Canada," Miss Harrison is proving her contention that flying "is a woman's job." The blonde aviatrix believes there is a definite niche for women in aviation, and particularly in wartime aviation.

"There is no end to the jobs which women pilots could do in wartime," says Miss Harrison, pointing out that both England and South Africa have auxiliary corps made up of members of her sex. "We could deliver military planes from the factories, fly mail and transport and instruct war pilots in flying. We could do all the 'behind the lines jobs' and release men for the actual business of fighting." Of course the reserve corps in England and South Africa still do not give women the job of instructing Air Force students, but Miss Harrison asserts that now the ice has been broken in her case with apparent success there is no reason why the normal objections to women doing the job can't be broken down.

Vancouver-born, Miss Harrison spent her early years in Canada and then, before she started school, moved with her family to England. Her academic education in Britain was topped off by a term in a Belgian school. After completing school, just reaching her majority, she planned to enter the hairdressing business. But a few airplane flights in England changed her mind and she turned to flying. That was in May, 1933. From the beginning she proved to have what it takes to be a good flyer. She made her first solo flight after six and three-quarter hours of dual instruction, with a hiatus of four months in her training. That training had been taken in two different types of planes—a *Moth* and an Avian.

In February, 1934, she was issued her private license in England. About this time she decided to tell her parents about her flying. "I waited until I had my license before I told them because I thought they might object," she says. For a short time after that she confined her flying to flitting about in her own planes. "I had a bit of money of my own and could afford to do that then," she recalls. In 1935 she journeyed to Singapore where she kept up her flying by an occasional flight.

It was not until 1936, after she had visited South Africa, that Miss Harrison began to take her flying seriously. In that year she obtained her British commercial "B" license which is almost equivalent to a transport license in Canada except that not so many flying hours are required.

"I did joy riding for about two and a half months after that which was my first venture into aviation in a commercial way,"

she said. "I heard they needed instructors very badly in South Africa so I decided to go there. But prior to leaving I obtained my instructor's endorsement in England. Late in 1936 I returned to South Africa and obtained a job as an instructor. About this time South Africa was beginning its scheme to train 1,000 students for the South African Air Force in three years. One day a military official came around and tested me as an instructor and much to my surprise said I could train them, which I did."

This unadorned statement tells little of Helen's activities as an instructor for two and a half years in Africa. She merited a letter of recommendation from Squadron Leader W. C. Kennedy of the R.A.F. who examined her and "found her satisfactory. She obtained very good results with her pupils." This seems to suggest military red tape was snipped more easily than usual. Actually there was such a dearth of instructors there at the time that everyone capable of doing the job was employed, Miss Harrison says.

While in South Africa she flew, and became the first woman in the empire to do so, a military aircraft—a Hawker *Hart*, one of the swift two-seater fighters of the R.A.F. This plane, although now replaced by even faster ships, was in its day one of the first-line ships of the R.A.F. This took place while taking a military refresher course there. Early in 1939 Helen returned to England where she obtained a position as instructor of the Civil Air Guard, an auxiliary of the R.A.F. similar to the National Guard in the United States.

Her family had moved to Richmond, Va., and Miss Harrison followed them there. She obtained her U. S. commercial 2S rating after a month's training. Then she learned instructors were needed in Canada. She drove to Ottawa, Dominion capital, where she was advised to interview Col. D. G. H. Joy, chief of the department of transport for Ontario at Toronto. There she was passed as an instructor. From Toronto she moved to Hamilton, Ontario, where she served as a test pilot and instructor with the Cub Aircraft Corporation.

It was from that position she went to the K-W Flying Club last November to train R.C.A.F. students. For a month Miss Harrison was sole instructor at the field, having complete charge of the five Air Force men then training there and also giving instruction to civilian pilots.

In her late 20's—Helen refuses to commit herself about her exact age—she is strictly a pilot while on the field. In a trim outfit of saxe-blue coveralls, with her blonde curls hidden under her helmet, ability and authority stick out all over her. Although she has not yet taken her military refresher course with the R.C.A.F.—her application for this is pending—Helen is able to teach her students all they need to know about slow rolls, snap rolls, loops, spins and inverted flying. Her refresher course in South Africa stands her in good stead now and she has added many instructional hours since. Her daring is unquestioned and while she refrains from boastful discussion of her work an extract from the *South Africa Air News*, December, 1937, gives an insight into this phase of her

(*Continued on page* 87)

Rubber Tanks for U. S. Warplanes

RUBBER fuel tanks are no longer a feature found exclusively in European warplanes. The bullet-sealing tank directly above is being installed in a Douglas bomber for the British; U. S. military and Naval planes also are being so equipped. Developed by the United States Rubber Company, this particular tank immediately seals closed holes made by .30 and .50 caliber bullets. In contrast to this tank is the big rubber-sealed fuel tank *(right)* removed from a German Heinkel bomber shot down in England by the R. A. F. According to the British, this tank holds 280 gallons of fuel, is basically rubber-covered with the usual metal construction inside. Both German and British warplanes use tanks similar to this.

Licenses

IN a special bulletin to FLYING, the Civil Aeronautics Authority released the following monthly statistics:

	Dec. 1 1940	Dec. 1 1939
Pilot certificates of competency active	62,000	30,821
Airline Transport pilot certificates of competency active	1,366	1,198
Student pilot certificates active	77,290	29,657
Glider pilot certificates of competency active	137	167
Student glider pilot certificates active	484	247
Mechanic certificates of competency active	11,005	10,252
Parachute rigger certificates of competency active	437	424
Certificated aircraft active	16,500	12,444
Uncertificated aircraft active	491	963
Certificated gliders active	39	42
Uncertificated gliders active	102	183

Pennies for Heavens

A BROWNSVILLE, TEX., man recently walked up to the local Braniff Airways ticket counter and stacked up 19 pounds of pennies to pay for a ticket to Dallas. The man, owner of several coin-operated machines, left Bill Basden (left) and Claude d'Hemecourte with a novel morning's work. The passenger was halfway to Dallas by the time they'd counted the 2,800 coins.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association, with Service Headquarters in the Transportation Building, Chicago, Ill., is a non-profit organization formed and composed of non-scheduled aircraft pilots and/or owners exclusively. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is devoted to news of importance to AOPA members and is of a non-confidential nature. Special releases are sent monthly to all registered members.

Change of Address

Association scribes have been troubled with frequent change of addresses of members—where members move and do not advise of their change. All pilots are requested to advise the Association immediately of their change of address. Do not fail to give your *AOPA registration number* and *last* address as well as your *new* address. This will avoid bothersome delays in your mail and will make our clerical force much happier.

Testing Top Lubricant

Among recent projects undertaken by the AOPA is the testing of a top lubricant in AOPA ships. This test is being made at the request of an oil and grease firm. The name of the product is CC 1000. Results of the test will be published in the AOPA Section (monthly bulletin to members). It is hoped that the use of this lubricant will (1) Increase compression (2) Increase gas economy (3) Free cylinders and rings of carbon (4) Give smoother engine performance. *Caution:* We suggest that any members conducting their own tests check their mixture control on carburetors after burning top lubricant the first hour or so. Preliminary reports indicate that a "loading-up" condition may result and mixture should be leaned out—this also indicates that a definite fuel saving may come about. Time will tell.

Map Survey

Recently AOPA has released several hundred questionnaires on the subject of a better map for private and non-scheduled flyers. These were circulated to a certain percentage of membership throughout the United States. This was not circulated to the entire membership, but any pilot having a particular interest in this subject will be mailed a questionnaire upon request. The result of this survey will be a better navigation map for "non-skeds."

In brief, it has been pointed out to us that existing air maps do not meet the needs of the average pilot *not engaged in scheduled airlines operation.* Obviously present air maps place the emphasis upon instrument flying, whereas the *average* private pilot flies contact. There is thus considerable information on the D.O.C. maps which is not used by the average pilot, and on the other hand, there is considerable valuable information which is lost in a mass of detail and difficult to locate under flying conditions. The foregoing facts lead us to believe that there is a definite need for more practical air maps designed specifically to meet the requirements of the average pilot flying privately.

The obvious beginning point in producing an air map is to determine just what kind of a map is desired—to eliminate those things which have been useless on other maps and to include or amplify those things that have been lacking.

Three large pages of detailed questions have been prepared covering every phase of air maps. The results will be compiled and turned over to the map makers.

When these maps are published they will be made available to members of the Aircraft Owners and Pilots Association *free of charge.* If you have a particular pet theory regarding air maps, send it in to AOPA so that we may make use of it.

Discount on Fire Extinguishers

AOPA members may now obtain AutoFYRstop fire extinguishers at 40 per cent off list by special arrangement recently negotiated by the Executive Secretary of the Association and Russell R. McManus (AOPA-3332). These extinguishers have been used for several years, are approved by Fire Control Authorities, and have been highly recommended to the AOPA. The AOPA, at the date of this writing, has not conducted any tests, but readers are urged to review the AOPA Section this month for further details. (The AOPA Section is edited about ten days after the "News" goes to press.) The manufacturer claims that the AutoFYRstop extinguishers will not "freeze, evaporate, leak or deteriorate. No refills necessary. No maintenance or service required at any time."

Two models are made, one in 16 oz. size and the other in 36 oz. size. If any members are interested in having further information, direct your inquiry to J. B. Hartranft, Jr., Executive Secretary, AOPA, Transportation Building, Chicago, Ill. Necessary forms for purchase will be forwarded. The list price of the two units are $3.50 and $5.00. AOPA members are entitled to 40 per cent off—plus *actual* cost of transportation. Shipment will be made direct from factory. Prices apply to AOPA members only.

AOPA-Hertz System in Operation

Final distribution of AOPA-Hertz Cards has been completed and already reports have come in to us on their use by members. The free telegram and transportation feature seems to be particularly popular—and, of course, the special rate which members received. A few pilots have written in advising that their cards have not been received. In the majority of these cases it was found that most of these pilots had allowed their membership to lapse and were not, therefore, entitled to this new AOPA service. Note: AOPA-Hertz card *must* be accompanied by an AOPA Registration card in good standing to be honored. We suggest that you mount both cards in the isinglass holder provided for that purpose.

AOPA Survey Ships Report Special Overnight Storage Rates

AOPA Survey Ships have reported the following additional hangar rate concessions for AOPA members:

Location	*Regular Price*	*For AOPA Members*
Cochran Airport, Cochran, Ga.	$1.50 up	$1.00 up
North Airport, Des Moines, Ia.	1.00	.50
St. Cloud Airport, St. Cloud, Minn.	1.25	1.00
Altoona Airport, Duncansville, Pa.	1.00	.75
54 B (Designation), Lebanon, Mo.	1.00	less 25%
Sexton Airport, Kennett, Mo.	1.00	.75

Regular forms are now available for filing information on airports; condition, transportation to town, phone numbers and many other items of necessary information. If you are planning a cross-country trip take some of these cards with

Additional AOPA car emblems now are on sale by Chicago office.

you and make one out at each airport you land at. Return the cards to AOPA headquarters where they will be placed on file for the benefit of other AOPA members. This file is an important part of the cross-country touring service AOPA is setting up for the convenience of transient air travelers. Your cooperation will be of great assistance.

New Series AOPA Exchange Privileges

Following AOPA's policy to add additional services for the convenience of pilots, the following services are now available for AOPA members. Read the AOPA Section for up-to-the-minute changes and additions.

CHICAGO, ILL. Pilots landing at Harlem Airport or Ashburn Airport in Chicago (or Chicago Municipal if radio equipped) may well receive free round-trip ground transportation in either the Hyde Park Hotel or Del Prado limousines providing pilots register at either of these two hotels. The travel time is 30 to 35 minutes depending upon traffic conditions.

DES MOINES, IA. Ralph Davis (official AOPA Des Moines Unit Greeter) will assist pilots to obtain hangar space or if none is available, stake-down equipment will be made available. Free ground transportation to the city.

DUNBAR, PA. Mr. Metcalf, manager, special services to AOPA pilots. Unit Headquarters at Y.M.C.A. in Connelsville.

MEADVILLE, PA. Facilities of club house available to AOPA pilots who land at Port Meadville. Contact J. R. Horn or W. C. McNutt for special AOPA services.

BRADLY, MONTANA. Free ground transportation to city for AOPA pilots. Contact Ray Woods (AOPA No. 3618) at airport.

AMARILLO, TEXAS. Free ground transportation. Call J. C. Frazer (No. 404), care Walter Irvin, Inc., in Amarillo, Texas.

CPTP Training Program

We have heard a number of stories about the CPTP quotas and several operators have written to us explaining that their quotas had not been met and that they were unable to keep up the payments on their ships due to this slump in business. Upon investigation of the particular situations which had been called to our attention, we found that there were two main reasons why this condition has come about. In the order of their importance they were:

1. The "army clause" or statement of intent recently added to the CPTP. It seems apparent that the students—or their parents—do not wish to put them under obligation for war duty as a premium for taking this program.
2. The requirement for two years of college training.

The first of these, the war clause, is perhaps understandable. In the beginning of the program there was some indication of this phase of public opinion when parental objections were registered and stu-

(*Continued on page* 89)

You Don't Say!

For U. S.

Sirs:

In your December issue you used a photo in which the caption stated our Swedish planes were to be transferred to Britain. This was based on an erroneous guess by the news agencies, of which I am well aware. Actually, the planes went to Uncle Sam. . . .

WILLIAM L. WILSON,
Public Relations Director,
Republic Aviation Corporation.
Farmingdale, L. I., N. Y.

Puzzle

Sirs:

In reference to your article "Can You Fly?" [December, 1940] would you mind telling me how the psychologists got the answer 93715, 93715, 93715, 93715, 93715? I went through all the mazes in less than nine minutes and passed everything else with flying colors.

ROBERT E. MYERS.
Chico, Cal.

● Author John R. Hoyt had better answer Reader Myers; we're still trying to get through the mazes.—Ed.

Rebuttal

Sirs:

. . . As I do with every story dealing with progress in aviation, I checked, double-checked and triple-checked every point [in "Baked Engines," FLYING, November, 1940] before submitting it to you. Knowing the sources of my information, I stand back of every point in my story. The letter [of Alex Johnson, page 86, FLYING, January, 1941] is aimless and denies but one point—that an order has been placed through the company for a baked engine for a Supermarine *Spitfire*. In answer to that, I have the sworn word of the inventors that they were taken to see a *Spitfire* and were provided with all the measurements for the engine installation, etc. They also swear they had numerous conferences with R.A.F. representatives before the Vancouver Sales & Appraisals Company popped into the picture. . . .

HOWARD WALDORF.
Oakland, Cal.

● Until he was assigned by us to write "Baked Engines," Author Waldorf, aviation editor of the Oakland (Cal.) *Post Enquirer*, knew none of the details contained in the finished article. The facts were supplied by Lloyd M. Taylor of San Leandro, Cal., and George A. Selig of Oakland, inventors of the engine, who are practically neighbors of Mr. Waldorf. One thing Mr. Waldorf does *not* say, however, is that an order definitely *has* been placed for a *Spitfire* baked engine.—Ed.

Insurance

Sirs:

I have been reading your magazine for several years so I am enclosing a check for a two-year subscription. The magazine is getting better and better and I want to compliment you on the article "Finance Your Flying" in the December issue. I especially like the parts where the article preaches safety and the part where it tells the pilots that they, not the insurance companies, set the rates for insurance. Too many people do not realize that the insurance companies are doing their best to lower aviation insurance rates as rapidly as possible. The other fellow's job always looks easy and, while most people realize that it takes time to work out technical problems in the advance of the aircraft industry, it is hard for them to see that the aviation insurance industry has technical problems of its own to work out which are just as difficult in their way as those confronting the aircraft engineers. However, we too are making progress and will continue to do so and lower rates as flying becomes safer. Many people do not realize it, but insurance companies make more money on lower rated risks than they do on the higher rated ones—generally speaking. . . .

E. L. STEPHENSON,
Branch Manager,
Associated Aviation Underwriters,
Chicago, Ill.

Corrections

Sirs:

. . . Two matters in particular prompted me to write. First was that the Fleet pictured on page 36 on your December issue happens not to be an American-built Fleet, but one built at Fort Erie, Ontario, and formerly owned and operated by the London Flying Club. Secondly, a fellow reader, namely Donn Hale Munson, seems to think he knows more about the R.C.A.F. than does our own James S. Duncan, deputy minister of defense. Allow me to correct him on a couple of points. The R.C.A.F. does not, as he says, possess any *Puss Moths* and, moreover, those in existence, being commercially grounded, are not issued as trainers but are privately flown by private owners. Also, Mr. Munson touched a sore spot when he crudely referred to *Tiger Moths* as "old klunkers." If he would trouble himself to ask anyone who has flown one he would be told they are one of the finest trainers in existence anywhere. Incidentally, contrary to Mr. Munson's conception of it, the Canadian press is as free as any press in the world and any fatal training accidents, some of which are bound to occur, can be read of in any Canadian daily. . . .

J. G. TOWNSEND.
Hamilton, Ontario, Canada.

● It probably will be safe to assume that Canadian officials, in times like these, tell the world only what they want it to know. Hence mention of any flaw in, for instance, the R.C.A.F. logically would draw an automatic denial from Canadian officialdom. Reader Townsend's statement concerning the freedom of Canada's press is more patriotism than fact. He should remember his country is at war.—Ed.

Ideas

Sirs:

. . . Why not allow readers to send you their ideas on improving . . . modern warplanes now to be produced for our gigantic new air force? Our planes should incorporate ideas that will keep

(*Continued on page* 85)

AERONCA

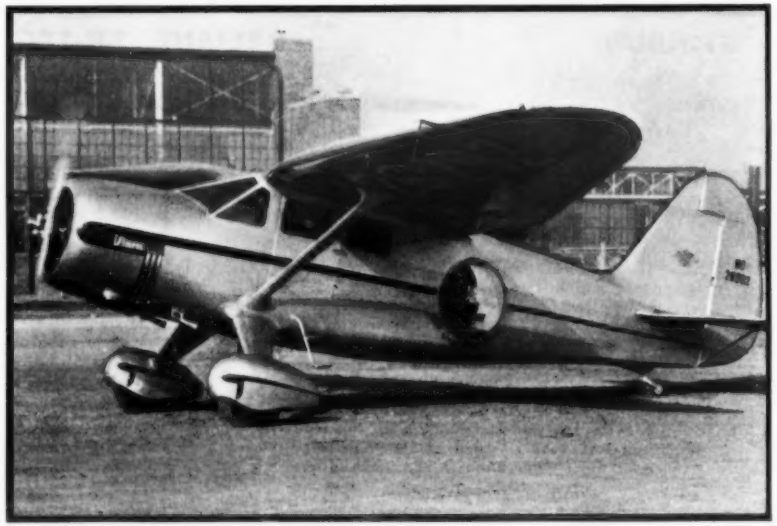
Tandem Trainer

Aeronautical Corporation of America — Middletown, Ohio

REARWIN

Skyranger, 175

Rearwin Aircraft and Engines, Inc. — Kansas City, Kansas



STINSON

Reliant, SR-10G

Stinson Aircraft Corporation — Wayne, Michigan

AIRCRAFT

TAYLORCRAFT

BC

Taylorcraft Aviation Company — Alliance, Ohio

REARWIN SKYRANGER, 175

COSTS: List price: $2,295. Minimum down payment (under credit plan now in use): 1/3. Annual insurance premium: $370. Operating cost per hour: $3.35.

PERFORMANCE: Miles per gallon of fuel: 20. Cruising speed at 75% h.p.: 100 m.p.h. Maximum speed at sea level: 110 m.p.h. Stalling speed: 38 m.p.h. Cruising range (excluding 10% fuel reserve): 450 miles. Service ceiling: 14,000 ft.

SPECIFICATIONS: A.T.C. 729. Type of airplane: CLM. Type of construction: welded chrome steel tubing, fabric covered. Engine: 75 h.p. Continental, A-75. Fuel capacity: 24 gals. Weight empty: 790 lbs. Weight loaded: 1,350 lbs. Span: 34 ft. Height: 6 ft. 7 in. Length: 21 ft. 9 in. Wing area: 164.6 sq. ft. Wing loading: 8.2.

ACCOMMODATION: Number of seats: 2. Baggage: 100 lbs.

EQUIPMENT: Instruments (standard on this model): Airspeed indicator, altimeter, tachometer, oil pressure gauge, oil temperature gauge, compass, switch, two fuel gauges.

SPECIAL FEATURES: Leading edge wing slots, 36 gallon fuel capacity (optional) increasing range to 750 miles.

TAYLORCRAFT BC

COSTS: List price: $1,730. Minimum down payment: $634.35. Annual insurance premium: $173. Operating cost per hour: $2.19.

PERFORMANCE: Miles per gallon of fuel: 27.7. Cruising speed at 75% h.p.: 88 m.p.h. Maximum speed at sea level: 97 m.p.h. Stalling speed: 35 m.p.h. Cruising range (excluding 10% fuel reserve): 250 miles. Service ceiling: 12,000 ft.

SPECIFICATIONS: A. T. C. No. 696. Type of airplane: CLM. Type of construction: Welded tubing. Engine: Continental A-50-5 or A-50-4. Fuel capacity: 12 gals. Weight empty: 632 lbs. Weight loaded: 1,150 lbs. Span 36 ft. Height: 6 ft. 8 in. Length: 22 ft. Wing area: 167 sq. ft. Wing loading: 6.88.

ACCOMMODATION: Number of seats: 2. Baggage: 30 lbs.

EQUIPMENT: Instruments (standard on this model): Tachometer, oil pressure, oil temperature, airspeed, altimeter, gas gauge.
Propeller: wood, fixed pitch.

AERONCA TANDEM TRAINER

COSTS: List prices: 50 TL, $1,375; 50 TC, $1,460. Minimum down payment: 50 TL, $458.34; 50 TC, $486.67. Annual insurance premium: 9 to 15%. Operating cost per hour: $2.19.

PERFORMANCE: Miles per gallon of fuel: 25. Cruising speed at 75% h.p.: 82 m.p.h. Maximum speed at sea level: 90 m.p.h. Stalling speed: 35 m.p.h. Cruising range (excluding 10% fuel reserve): 250 miles. Service ceiling: 15,000 ft.

SPECIFICATIONS: A. T. C. No. 728. Type of airplane: CLM. Type of construction: Tubular steel fuselage, spruce spars and metal ribs. Engine: 50 TL, 50 h.p. Lycoming; 50 TC, 50 h.p. Continental. Fuel capacity: 12 gals. Weight empty: 700 lbs. Weight loaded: 1,150 lbs. Span: 35 ft. Height: 7 ft. 2 in. Length: 22 ft. 4 in. Wing area: 169 sq. ft. Wing loading: 6.8.

ACCOMMODATION: Number of seats: 2. Baggage: 40 lbs.

EQUIPMENT: Instruments (standard on this model): Airspeed indicator, oil pressure gauge, oil temperature gauge, tachometer, altimeter, engine primer and gasoline shut-off valve. Other interior fittings: Complete upholstering.
Propeller: wood, fixed pitch.

STINSON RELIANT, SR-10G

COSTS: List price: $12,585. No minimum down payment. Annual insurance premium: 13½%. Operating cost: 13 cents per mile.

PERFORMANCE: Miles per gallon of fuel: 7.65. Cruising speed at 80% h.p.: 147 m.p.h. Maximum speed at sea level: 152 m.p.h. Stalling speed: 59 m.p.h. Cruising range (excluding 10% fuel reserve): 765 miles. Service ceiling: 14,200 ft.

SPECIFICATIONS: A.T.C. 678. Type of airplane: CLM. Type of construction: fabric and metal. Engine: 290 h.p. Lycoming R-680-E1. Fuel capacity: 100 gals. Weight empty: 2,605 lbs. Weight loaded: 4,000 lbs. Span: 41 ft. 10½ in. Height: 8 ft. 7 in. Length: 27 ft. 10¼ in. Wing area: 258.5 sq. ft. Wing loading: 15.5.

ACCOMMODATION: Number of seats: 5. Baggage: 150 lbs.

EQUIPMENT: Instruments (standard on this model): Altimeter, compass, airspeed, bank and turn, rate of climb, tachometer, oil pressure and temperature gauge, carburetor air temperature gauge, manifold pressure gauge, ammeter, fuel level gauge.

SPECIAL FEATURES: Vacuum-operated flaps, single strut, semi-cantilever, tapered wing, hinged cowl, 15 amp. generator.

by HURD BARRETT

YOU READERS have responded nobly. The many letters have been gratifying. But there are a couple of points we have to make clear. We are *not* running an employment agency. We can't. And, as we can not undertake to answer each letter individually, what we are going to do is to cover those letters which group themselves into similar classes—giving the initials of the readers who have written in to request information. Incidentally, we can *not* recommend, by name, any specific training school; because many of our advertisers are trade schools and most of them are of equal excellence. We can not discriminate between one and the other.

Likewise, we urgently recommend that you look at earlier editions of this column in FLYING. Lots of your questions have been answered in previous issues. In that event there is, you will admit, no point in re-answering them. You can go to your public library or second-hand book store and look back to find the answer to the question you are asking.

We promised we'd cover clerical workers this month. We can't, because by far the greatest percentage of our readers have requested other information. But we believe that the clerical field in all branches of aviation presents excellent opportunities for employment for people who are unskilled in mechanics and in engineering techniques. If we get sufficient inquiries next month, we'll try to cover this field very thoroughly. . . .

Now, this is important. We have gone into it before. We have explained that the most formidable obstacle to qualified men's getting jobs is the fact that they live at a considerable distance from the plants of their prospective employers. If you live in West Los Angeles, Calif., for instance, you will have Lockheed, Vultee, Douglas, North American and a number of other plants within a couple hours' radius. On the other hand, if you live in Minnesota aircraft plants and their employment offices are located at some distance from you. Local men can usually get an interview in person, whereas you can't. No company in the world is going to encourage you to come to their city, unless you are a highly skilled specialist. You can't blame a prospective employer for not hiring you when he has at his door applicants who are as skilled as you are.

Remember this—and don't try to write letters of application unless you can present yourself at their employment offices. They will naturally take the first man who comes along with the qualifications they require—even though possibly you may be a better man for the job. Your personal financial headaches are none of their concern. They cannot afford to gamble on someone whom they cannot talk to personally. If they can find a man on the spot who can fill the jobs that are open, they are going to hire *him*—and *you* are going to be out of luck. We cannot stress this point too strongly. . . .

* * *

A number of people have written, saying they have had experience as machinists. We refer you back to our article of three months ago in FLYING. As a rule, machinists can secure employment merely by presenting themselves at the personnel windows of any major manufacturer of aircraft or aircraft power plants. We've had letters from a number of experienced and qualified machinists who want to be employed in aviation. One of these is A. E. F. of Baltimore, Md., who informs us he is coming to the Pacific Coast because of his wife's health. A. E. F.—and those others of you have written in to say that you have had two or three years' experience in the operation of machine tools—should have no difficulty in obtaining employment with any of the major manufacturers on the Pacific Coast. Just give your qualifications. That should be enough.

"I'll tell you when it's time to retract the landing gear!!"

* * *

L. G., Cincinnati, O. . . . You are not specialized. While model aircraft building may be the road into the aircraft industry, it will not in itself provide an *entré*. Most manufacturers, however, do employ commercial artists. You might try this angle. Your experience in drafting should be stressed when you make application for employment. Be careful, in your application, to state all of your experience and qualifications and present yourself as a specialist in the line in which you think you are best. This applies to all of our correspondents; do *not* leave any employment you may have merely because you believe, on the off-chance, that you may be able to get into the aircraft industry. Nor that the aircraft industry is romantic; it is a business like any other.

You owe it to yourself to keep any job you may have. It is difficult enough as it stands to make a living for yourself and your family.

* * *

We wish everyone over the age of 40 would re-read the last two columns we did for FLYING. Older men are, as a rule, more careful than young men. There's a place for them in every branch of aviation and we do not believe that any personnel manager will hold their age against them if their qualifications are equal. Older men, however, are subject to the same disadvantages as younger men. If they live at a considerable distance from aircraft manufacturing centers, they will not be able to secure employment without presenting themselves in person.

A. M. P., of Brooklyn, N. Y. You have ample qualifications for a job in the engineering department of almost any aircraft manufacturer. There are many firms in your locality who hire men of your ability, but you'll have to go after it. Consult your local classified telephone directory. Don't write letters. Go see them; and stay with it until you get a job. Don't over-rate yourself, though. Remember, after all, you are a beginner. We'd hit for template layout, scheduling or some similar field. But you might try the processing engineering divisions, too. Stress your mathematics and chemistry; but see the manufacturers in person.

M. J. B., Kewanee, Ill. You are a photographer. Next month, we are going to try to go into the opportunities in this field. If you are an "instrument technician," you shouldn't have much trouble getting a job. Instrument technicians—people who can work efficiently on delicate instruments—are hard to find. You should only have to apply in person. We'll find out what the requirements are for aerial photographers before next month.

S. H. Y., in Florida, writes that he has had considerable experience in mechanics, as well as a valid private pilot's license. He has operated flying fields, been an experimental engineer with a major automobile manufacturer and handled stock room work clerically. Also, he has written aviation columns for local newspapers. We feel that S. H. Y. should decide for himself what he wants to do

in aviation and concentrate on it. Anyone with his qualifications should have no difficulty in getting employment. Licensed airplane pilots, by the way, should write to the Civil Aeronautics Board, Washington, D. C., to find out whether or not they are qualified for flight training by the Civilian Pilots' Training branch.

H. E. K., Denver, Colo. You are at a disadvantage, because you are located at some distance from the centers of aviation manufacture. Your hernia would be a handicap. Otherwise, the fact that you are a painter would probably gain you employment with one of the major factories, if you were able to present yourself to their personnel office. We would not, however, advise you to leave your present job on the chance of employment.

J. W. W., Rainier, Ore. If you are gainfully employed, we would not advise you to change employment. Your qualifications, apparently, are not exceptional. You might go down to the office of one of the airlines in your city and talk to its manager. We would not advise you to spend too much money on specialized training, though.

L. R. J., Sauk City, Wis. You have not told us enough about your training to enable us to judge your possibilities. We cannot, unfortunately, grant personal interviews.

W. K., Allentown, Penn. See last month's issue of FLYING for data on the requirements for draftsman. Your qualifications appear to be excellent.

M. C., Summit, N. J. We are glad you like the column. If you will write in, giving us your qualifications in detail, we will try to answer your question here

S. S., Princeton, Ill. As we told you in our first article, the "Mechanically inclined" jack-of-all-trades doesn't stand much chance in present-day aviation.

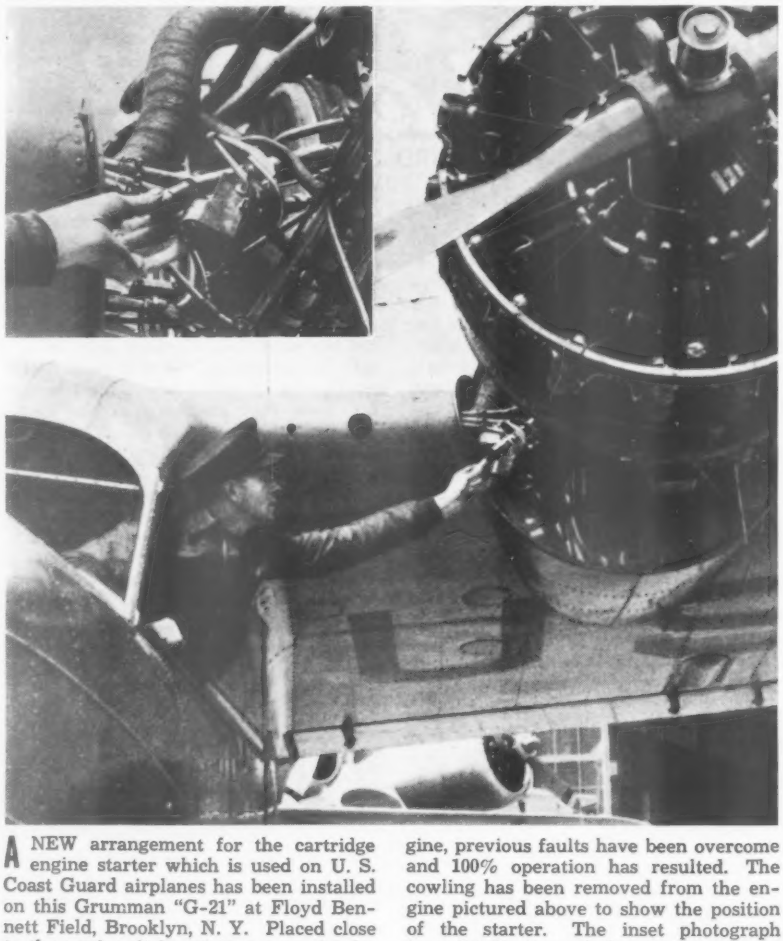
B. G. B., River Edge, N. J. Apparently you have the qualifications for aircraft work. Although you were washed out of the Army Air Corps for physical reasons, you probably have attributes that would suit you for the industry. What you should do is to frankly state what's happened, when you apply for employment in person at one of the major factories. After that, we would leave it up to them. Since you managed to obtain an appointment to the Army Air Corps Cadets, you evidently have valuable qualifications which would recommend you to the aircraft industry. Stress the stuff that got you accepted as a cadet. You state that there may be a possibility of your being permitted to continue your education as an Army flyer, on the bounty of "well-to-do women," even though you have been disqualified. Don't count on it. Anything you do, we believe, will occur, by necessity, through your own qualifications.

V. E. B., Prescott, Ariz. If you were on the spot where a major manufacturer is located, you could probably get a job. We liked your letter. Apparently, if you had kept up with the profession, you could qualify as an aircraft electrician. We'd advise you to apply for such work.

J. R. S., Northwood, Ia. If you watch

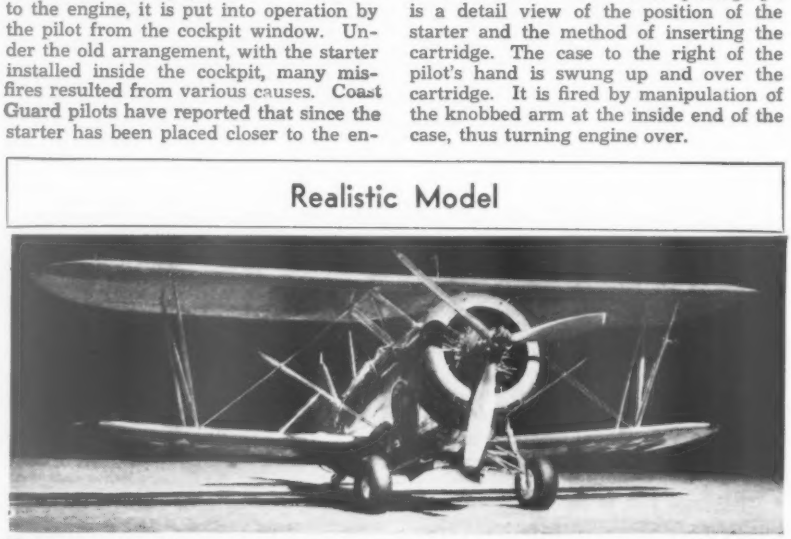
(*Continued on page 80*)

Shotgun Starter



A NEW arrangement for the cartridge engine starter which is used on U. S. Coast Guard airplanes has been installed on this Grumman "G-21" at Floyd Bennett Field, Brooklyn, N. Y. Placed close to the engine, it is put into operation by the pilot from the cockpit window. Under the old arrangement, with the starter installed inside the cockpit, many misfires resulted from various causes. Coast Guard pilots have reported that since the starter has been placed closer to the engine, previous faults have been overcome and 100% operation has resulted. The cowling has been removed from the engine pictured above to show the position of the starter. The inset photograph is a detail view of the position of the starter and the method of inserting the cartridge. The case to the right of the pilot's hand is swung up and over the cartridge. It is fired by manipulation of the knobbed arm at the inside end of the case, thus turning engine over.

Realistic Model



THIS shiny U. S. Navy Grumman F3F-2 looks as if it were poised for flight, but it is a model and not a photograph of the real craft. Jon W. Hauser of Detroit built the detailed model. Winner of the Clyde Lucas Trophy, the model has fully retractable landing gear. Its cockpit is furnished with controls, starter, battery, stabilizer and rudder trim controls, radio, safety belt and seat pack parachute.

PROPELLER DESIGN FACTORS

by RAOUL J. HOFFMAN

THE initial standing or static thrust of a propeller is used to estimate the time or distance of a take-off of an airplane. Many useful empirical formulas have been developed which, however, may be applied only to problems in which the diameter of the propeller is known to give the required flying performance. Standard thrust and power equations should be applied for correct answers.

In the early days of aviation, static thrust was the only verification of the correct functioning of the engine; a spring scale and a fence post was necessary to give the pilot confidence in a possible take-off.

According to accepted theories, the thrust of a propeller is equal to the pressure and velocity head given to the air pulled through the propeller disk. Only the velocity head or the velocity of the slipstream will suffice to make calculated and measured thrusts congruous.

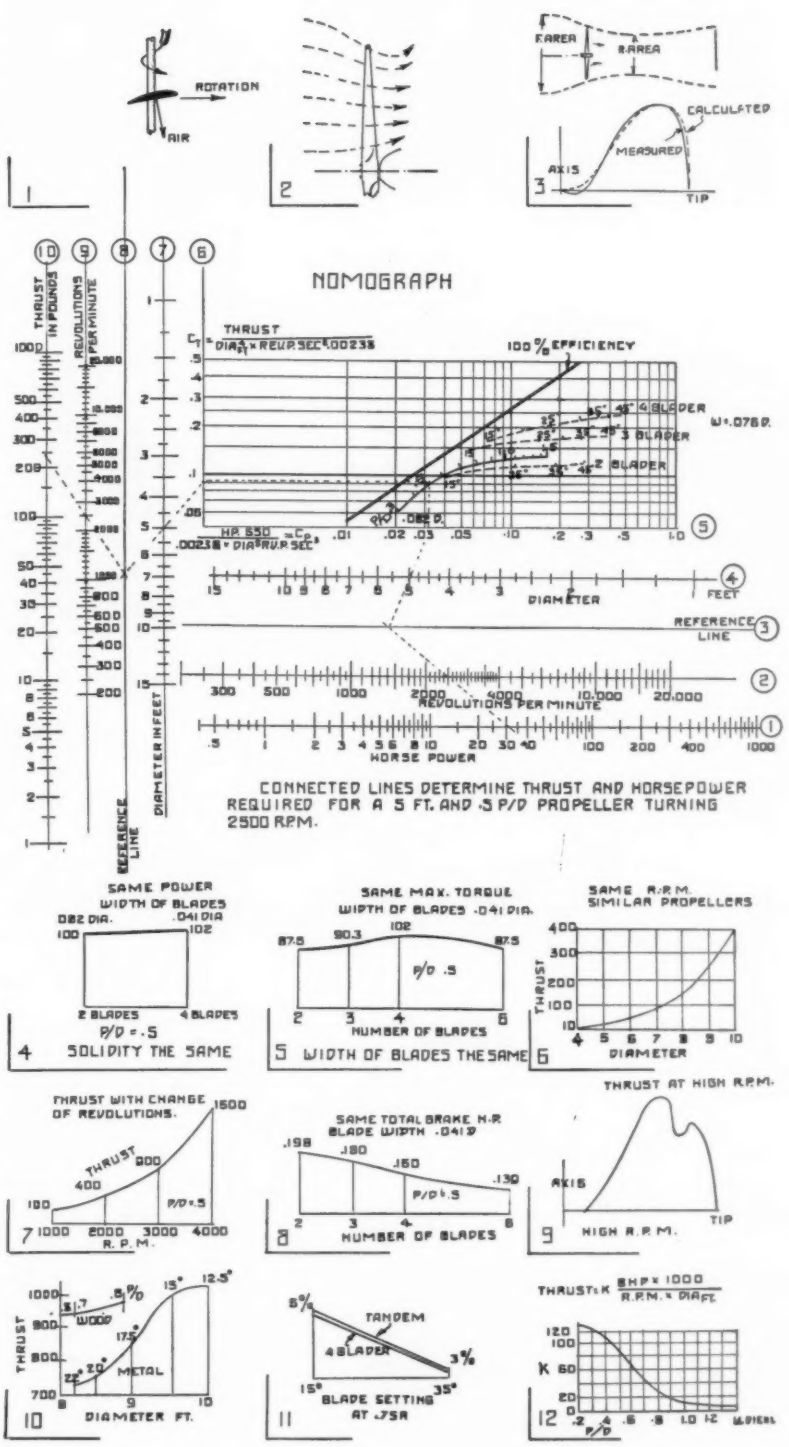
A sketch in Section 1 will aid in visualizing the workings of a propeller at zero advance. A small wing or propeller section rotates about an axis. The inclined airfoil forces the air downward and consequently, in reaction, pushes the airfoil upward. This upward force is the resulting thrust. The air, however, does not move axially, but has a slight inclination in the direction of the rotation. This tangential motion results in the twist of the slip stream, which is the reason for the off-set of the rudder.

The sketch in Section 2 illustrates the paths of the air filaments through the propeller disk. They converge towards the center and have a boundary similar to the outline shown in Section 3. This is self-explanatory, for the mass of air in front of the propeller disk must be equal to the accelerated mass behind the disk. Applying a few correction factors for inflow and interference, the thrust of a propeller is easily calculated by the blade element theory. Curves drawn in the lower diagram in Section 3 show the small divergence between the measured and calculated thrust gradients.

Measurements show that the thrust is zero at .2 R of the propeller and that, within this section, the airflow is reversed. The cause is that the sections near the hub are no longer lifting airfoil sections. Usually the fuselage fills in this portion. Lately, on metal propellers the inefficiency of the rounded shank has been reduced by mounting an airfoil "cuff" over it. Another improvement is to give the propeller a slightly higher pitch towards the tip.

Many factors influence the static thrust of a propeller. The diameter, revolutions per minute, width of the blade, planform, airfoil section used and the pitch will govern the static thrust of a propeller. The geometrical pitch is the distance the propeller would travel in one revolution if allowed to slide on its flat or working side of the blade taken at ¾ distance of

(*Continued on page* 82)

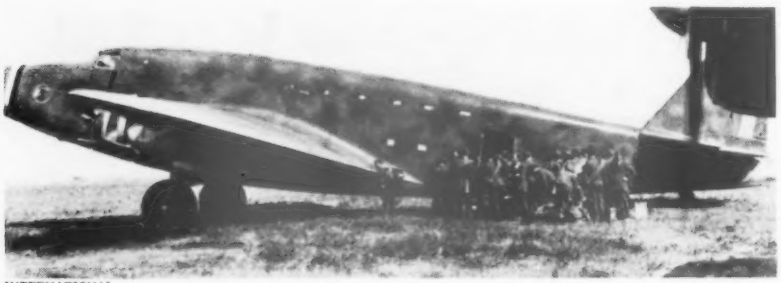


The sketches and tables above illustrate propeller computations.

HAVE YOU SEEN ?

Now being tested for possible use as a trainer is this experimental tricycle-geared Culver "Cadet." Retractable gear is coupled with throttle, preventing belly landings.

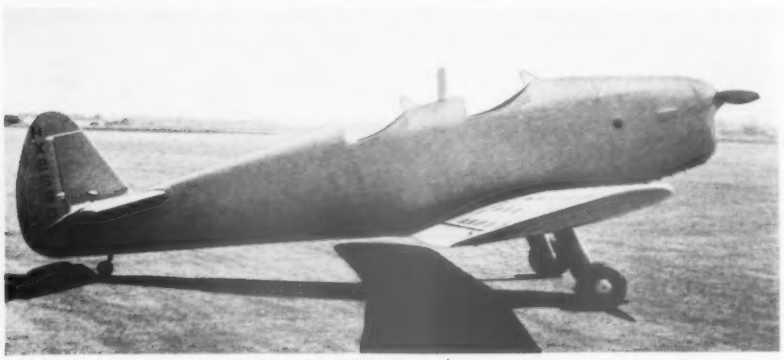
Newest low-wing trainer now being flight-tested at Wichita is this Stearman X-90. Present engine is 225 h.p., replaceable with 450 h.p. engine. Landing gear retracts.



INTERNATIONAL

Recently released by Italian censors was this photograph of a new tri-motored troop carrier. Though not named, the ship has strong resemblance to Savoia-Marchetti design.

Expected to enter the low-wing trainer field is this St. Louis Aircraft Corporation's PT-LM-4. This two-place monoplane is powered with a 180 h.p. Ranger 6-440-C3 engine.



Recently tested at Wright Field was this new Southern BM-10 trainer with 225 h.p.

Above is prototype of McKellar M-1, described originally in "Flying," June, 1940.

BRITISH COMBINE

Among first Italian planes shot down by R.A.F. in England was this Fiat CR-42.

BRITISH COMBINE

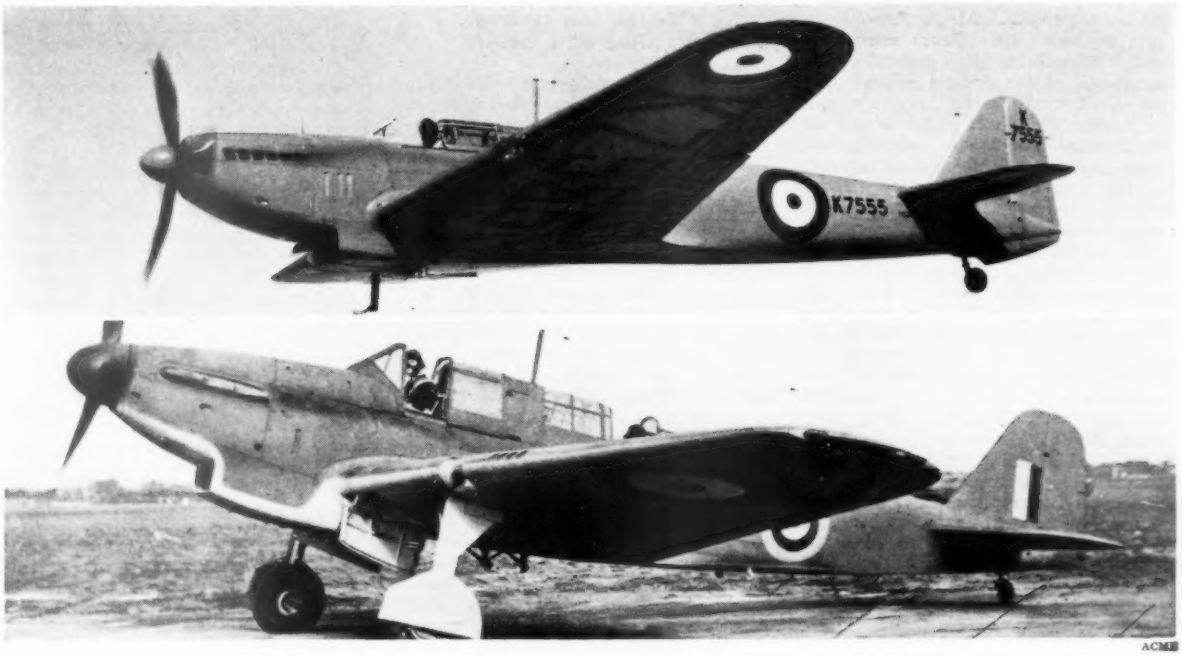
Recently shot down by R.A.F. fighters, this Messerschmitt Me-110 fighter is on display in London street. The Me-110 has two 1,150 h.p. engines, top speed of 365 m.p.h., four machine guns, two cannon.

ASHE

Parke "Tee-Dee" gets 250 m.p.h. from 100 h.p. Lambert.

Mercury BT-120 has negative stagger, 120 h.p. Ken-Royce.

Fairey "Fulmar" (bottom) is eight-gun British Navy fighter developed from old P.4/34 (directly below).



ACME

Let's Defend What We Have!

(*Continued from page 26*)

coast and survey the remainder of our fortified zones, our encampments and our airports. It's a worthwhile junket. Every patriotic citizen should make this junket. California boasts a 1,000-mile coastline, 6,500,000 souls and (besides the aircraft and petroleum industries) huge acreages of foodstuffs and mines. As we travel, the Regular Army, National Guard and Reserves have trekked 40,000-strong to the state of Washington for the West's mightiest maneuvers. There'll be a raft of tactical writings shuttled to the nation's capital when *that's* over.

As of the spring of 1939, the Pacific area contained some 12 workable anti-aircraft guns, mainly at MacArthur, San Diego's Fort Rosecrans and San Francisco's Fort Winfield Scott. Yet hard-shelled artillerists wanted 300 for the adequate defense of Los Angeles alone, for to fend off marauding bombers (assuming Problem No. 1, the Fleet's detention in the Atlantic, ever occurs) you must literally "screen" a city with three-inch high-explosive shells.

A quick checkup of California shows in pitiful clarity that it lacks essentials: coastal defense guns, antiaircraft batteries, tanks, enlisted men and mobile artillery. Part of the Ninth Corps Area, the state has a plethora of forts. Not all are exactly A-1 towers of strength. But all have been located with great strategy, although the erstwhile predominance of San Francisco as a shipping-manufacturing center has tended to bring a too-great concentration of fortified strength around the Golden Gate.

All is confusion as the Regular Army girds itself for its long-awaited expansion. At the Presidio at Monterey, officers are busily filling in the skeletal framework of the Army's newest division—the Seventh. It will devolve around the nuclear 76th Field Artillery and the 11th Cavalry. The former, naturally, will stress invasion-defense and antiaircraft; the latter, mechanized warfare. Today there are few guns and fewer tanks at Camp (soon to be Fort) Ord.

Yet the veriest tyro at military tactics now knows the utter *vitalness* of such equipment. It's on order. Early this year, at a time when Hitler was readying for his unbelievable smash through the Low Countries and his conquest of France, America's most extensive "amphibian" combined Army-Navy activities took place near Monterey. When they ended, the above facts stood out clearly. It was the old, old story. The "enemy," in 80 warships, transports and possessing 350 carrier-based planes, swept toward the shores. Against them the "defenders" pitted 300 planes, mostly from the Air Corps bases at March and Hamilton Field (just north of San Francisco), a few defensive warships and a small Regular army. What happened?

On the morning of January 20 the Los Angeles *Times'* story of the "invasion" declared bluntly:

"Alien hordes trampled historic California soil here last night."

From dawn to high noon the "enemy" warships had blasted away at coast defenses while the carriers spewed waves of bombers inland to smash at airports and vital communications. By midday, few unscathed air bases could send many a ship aloft to parry these dreaded blows. What's more, the defenders discovered that the "citizen-warning system," which had performed notably the preceding fall under less stringent conditions, failed because cohesion was lacking among the various elements involved—from Forest Rangers to telephone linemen.

Secrecy fled. The carrier-sheltered planes, 100 miles at sea, detected operations of landplanes through a Civil Aeronautics Authority "clear-the-air" warning to private flyers. Impromptu bases of defending craft were easily spotted after a few reconnaissance jaunts.

"Ensign Berry landing. . . . Hold still a minute!"

We have used much valuable space describing these exercises. But the lesson is worth it. For January and August, 1940, offer little choice when it comes to a defense of the West Coast.

Now, on with our tour. Out at March Field officers are awaiting the green light on a 100-or-more per cent expansion of facilities. Its present 640 acres may increase to 1,500. Hamilton Field, too, may get $150,000 for improvements. In the weird, wild wastelands north of Barstow, in the Mojave Desert, 749,000 acres were purchased, at a cost of $250,000, for antiaircraft gunnery practice.

Southward, on Muroc Dry Lake, March Field bombers have established one of the world's finest TNT-dropping ranges. You hear encouraging tales of the efficiency of the Air Corps' touted bombsight as tested-and-proved over this arid, one-time waterbed.

Practice is swell. Men need it. You don't become an artillery expert just squinting through a gunsight. But: first of all you must own a gun. Here we interject a brief account of the country's greatest antiaircraft exercises which took place some 18 months ago just south of Los Angeles.

The inevitable "enemy army" had landed below the Mexican Border. On the morning of April 15, 1939, this force had pummelled its way to striking distance of the oil fields, aircraft factories, waterworks. The situation was desperate. So a Yankee army of 240,000 men decided to gamble on a dawn offensive on the 16th.

Into the lap of Col. Edward A. Stockton, Jr., commander of Fort MacArthur and a veteran Panama Canal defense-strategist, was tossed the ticklish task of sweeping the skies of enemy bombers and strafers during the bold charge. The Colonel took his orders quietly. Over the night of April 15-16, he directed 650 officers and men. They emplaced 72 three-inch antiaircraft guns in a semicircle between the opposing armies near Santa Ana. Around these rapid fire altitude (efficient to 17,000 feet) weapons, some 284 .50-caliber machine guns were set in spread out battery form. Dawn broke. The guns, it turned out, had been admirably placed. An enemy would have been badly nicked by their devastating fire—except for one thing: instead of 72 actual antiaircraft guns, Colonel Stockton was able to muster *four* for the war game. And, instead of the 284 machine guns so urgently needed to protect the artillery men against dive bombers and attack-bombers, he could bring *eight*. This was a sorry spectacle. Colonel Stockton himself delivered this masterful understatement of the case:

"Our maneuvers proved the crying need for more guns . . . the men themselves acquitted themselves admirably."

In the previous autumn the Army had disclosed that "all the antiaircraft guns east of the Rockies aren't sufficient to defend a city of 50,000 persons." They added cryptically that in the whole nation only 26 searchlights of 8,000,000 candlepower each existed for the vital job of spotting night-raiders. Ten of these went to Hawaii. As a year passed the situation didn't change materially. California got about enough equipment to protect a Hopi Indian pueblo.

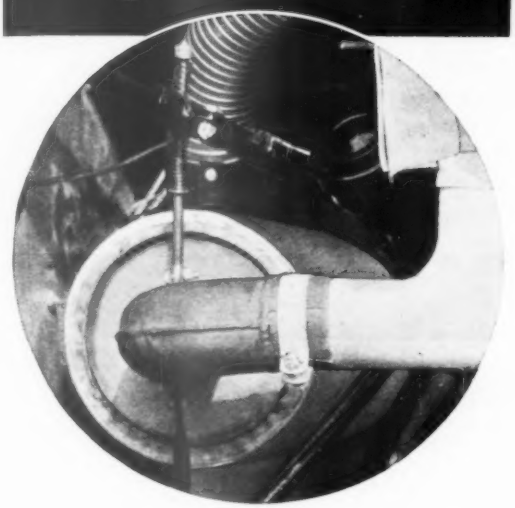
But the picture now *is* improving, albeit slowly. Sacramento has been given a $7,000,000 air depot for repairing front line aircraft. March Field increased from less than 2,000 officers and men to more than 3,000. It got long range, four-engined B-17 *Flying Fortresses* to supplement its twin-motored B-18s which were sturdy as rocks and excellent for peacetime training. It soon will have a contingent of Douglas A-20As—those lethal, 400 m.p.h. twin-engined attack-bombers which (*Continued on page 64*)

PIPER POINTS THE WAY
TO A NEW HIGH STANDARD OF COMFORT IN FLYING!

New Quietness in ALL PIPER '41 MODELS

Standard Equipment on All Three Models Includes a Stainless Steel

Exhaust Muffler



INTRODUCED last year on the Piper Coupe, the noise-reducing, stainless-steel Piper exhaust muffler won instant acclaim throughout the aviation world. This year *every* Piper model—Coupe, Cruiser and Cub Trainer (except 40 h.p.)—will fly quietly with engine noise muffled to a smooth purr, thanks to this achievement of Piper engineers.

Private owners will enjoy the extra comfort of quiet flying. Instructors and students will appreciate the ease of communication and better understanding of instructions. Operators will be quick to recognize the advantages of selling *quietness* to prospective plane buyers, along with all the other features that make up Piper leadership. *You* will discover greater pleasure in flying one of the new *quiet* Piper airplanes!

FREE FLIGHT DEMONSTRATION will be given by your Piper Dealer. There's a Dealer at every leading airport.

FREE FLYING COURSE of dual flight instruction in your own plane by a Government-licensed instructor when you buy a new Piper airplane.

FREE FOLDER and details of the free flying course will be sent on request or may be obtained from your Piper Dealer. Piper Aircraft Corporation, Dept. PA21, Lock Haven, Pa., U. S. A.

Tune in "Wings of Destiny" NBC Every Friday 10 P.M. (E. S. T.)
Continental "65" Piper Cub Given Away Each Week

PIPER

OUTSELLS ALL OTHER LIGHT PLANES COMBINED

FROM OUR NEW MODERN
TRIPLED CAPACITY PLANT

Proudly we Present for 1941

The New TAYLORCRAFT *De Luxe*

Choice of 5 New
Interior and Exterior
Modernistic Duo-tone
Color Combinations
AT NO EXTRA COST

Wheel Pants optional at extra cost.

Now for the First Time In a Low-Priced Airplane

★ NEW HARMONIZED DUO-TONE COLOR BEAUTY INSIDE AND OUT

From its sleek, lovely lines to its handsome cabin refinements, the 1941 Taylorcraft DeLuxe is a beauty to behold. Sparkling with a distinctive new modern type of style-beauty and flight-convenience features, this dependable, economical airplane will take your eyes and win your heart the minute you see and fly it.

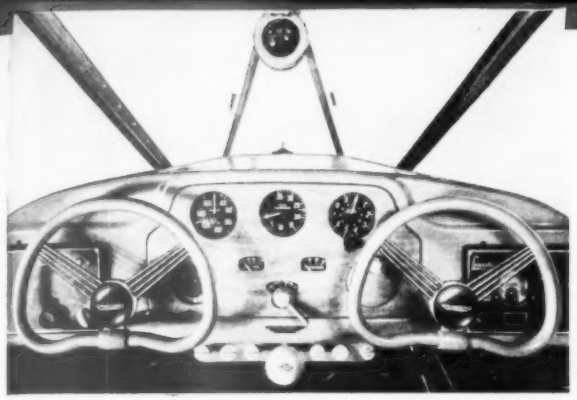
Taylorcraft's new Duo-Tone styling brings you the kind of color harmony you want, inside and out, with a choice of five delightful combinations.

Exterior standard finishes include Duo-tone Ivory and Metallic Red, Ivory and Metallic Blue, Yellow and Metallic Blue, Red and Black, and Yellow and Black.

And the cabin interior combinations harmonize with the exterior colors — a complete symphony of beautiful colors — at no extra cost.

This is but one of the many new advances that now feature the new 1941 Taylorcraft DeLuxe. Words alone cannot do justice to the beauty, comfort and flying performance of this stunning new, modern airplane. You have to see it — and fly it yourself. Only then will you fully realize the extraordinary value Taylorcraft offers you today.

Join now, with the thousands who will enjoy more fun in 1941 — with a Taylorcraft.



★ NEW "FUNCTIONAL" INSTRUMENT PANEL

More than a masterpiece of beauty — completely functional in design • Provides for easy installation of blind flying instruments, including one or two-way radio equipment • Individual standard size aircraft instruments properly grouped for functional use as approved by expert instrument pilots • Two glove compartments and ash tray • Panel finished in beautiful walnut grain • New, convenient grouping of plastic control knobs • Instrument sub-panel mounted in rubber • New, plastic "knee-free" control wheels • In every way this modern instrument panel is the most convenient and practical ever designed for light aircraft.

★ MORE SPACIOUS LUXURIOUS CABIN

Rich Duo-tone Mohair upholstery fashioned in the modern trend to harmonize cabin interior with exterior colors • Larger luggage compartment • New, convenient shelf behind luggage compartment • New, rigid double panel doors tailored for snug fit • New, automatic door latches and streamlined handles • Door equipped with key lock • Adjustable door windows • Two new rear cabin windows for greater vision • All doors and windows draft-proofed by rubber seals and wind lacing • Two "controlaire" cabin ventilators.

The Sweetest Flying — Smartest Looking — Low-Priced Airplane

★ 50% INCREASE IN CRUISING RANGE

Standard gasoline capacity increased to 18 gallons • Cruising range (no wind) 375 miles.

★ FULLY WIRED FOR NAVIGATION LIGHTS

Provides for quick, simple installation of lights whenever desired.

★ NEW AIRLINE TYPE TRIMMING TAB

Convenient crank control located in cabin ceiling.

★ BEAUTIFULLY STYLED COWLING DESIGN

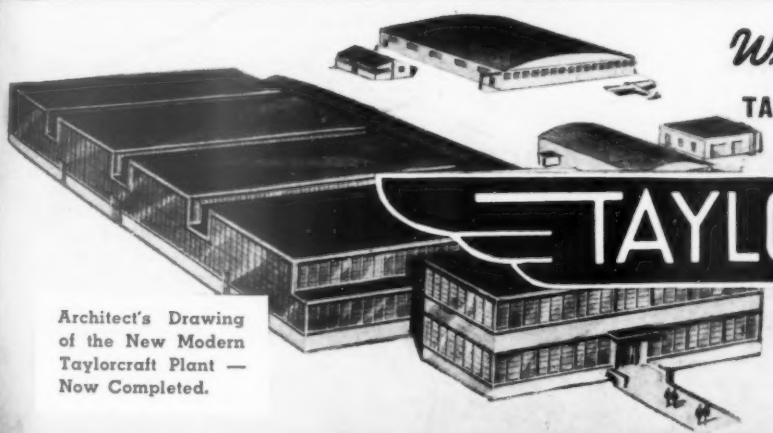
Sparkling Chromium grilles and streamline side molding.

★ AND MANY MORE OUTSTANDING FEATURES FOR YOUR GREATER COMFORT, SAFETY AND PLEASURE

Its "New-as-tomorrow" Styling and traditional Taylorcraft dependability will make you proud and happy to own this newest and finest economical airplane!

The price of a new Taylorcraft is among today's lowest. You can buy it with Low Down Payment — Easy Terms.

Visit your Taylorcraft dealer and see how easy it is to buy the new Taylorcraft De Luxe. Ask him for complete details on the convenient time payment plan. He cordially invites you to inspect the beautiful 1941 model and to take a demonstration flight.



Architect's Drawing of the New Modern Taylorcraft Plant — Now Completed.

Write Today for complete description, specifications and performance data.

TAYLORCRAFT AVIATION CORPORATION

DEPT. 14 ALLIANCE, OHIO

TAYLORCRAFT

AMERICA'S MOST MODERN LOW-PRICED AIRPLANE

(*Continued from page 60*)

helped France so mightily before disaster struck.

As word came to Congress that Soviet Russia had quietly moved into Deshnet Peninsula—less than 100 miles from our Aleutian Islands—with full military equipment, the lawmakers went to work. Now the Army's request for a multi-million dollar base at Anchorage at last may be heeded.

This is significant. Always, strategists have pointed out that a potential invader of the United States would strike either from Mexico (after easing unexpectedly into prepared positions) or from Alaska. Both are vulnerable. Now Anchorage, plus the Navy's fast-strengthening Kodiak, Sitka and Dutch Harbor bases, may bar the latter eventuality.

We know that Southern California aircraft factories are expanding rapidly to the tune of millions of dollars and square feet. Any one of them lies within "spittin' distance" of a dreadnaught's big guns. You can't camouflage them from the skies. They're too sprawly. So our defenses must be directed at warding off any possible attacker. Because we've given up this outmoded notion of *abandoning* the West Coast.

None of the companies have prepared underground storage hangars. To date, the idea of an invasion has been pretty remote and rather fantastic. Besides, what's the use? Production is the cry; not mere, comparatively useless storage.

Other strategists declare with considerable basis for their statements that, practically speaking, California's industrial area really isn't any more vulnerable than those around the Great Lakes or the Gulf of Mexico or the Atlantic Coast. Once an enemy seizes a foothold in the hemisphere, it could launch damage-dealing attacks by long range bombers. After all, land-based planes have a tremendous tactical advantage over carrier-based machines. Thus complete aerial control over sea lanes leading to the Pacific Coast is a No. 1 consideration. In 1936, Brig.-Gen. H. H. Arnold, then-commander of March Field, said just that as he left for Washington eventually to become Chief of the Air Corps. He told this writer flatly that 40 high-speed bombers, launched from a carrier, could completely demoralize the Los Angeles area by bombing the exposed siphons of the aqueducts from Owens Valley and the Colorado River. Without this far-fetched water, the southland not only would go thirsty but it wouldn't have enough water to fight fires or grow food to eat after three days.

Vulnerable, too, General Arnold said, are the Boulder Dam powerlines, the Watson fuel storage depot, rail tunnels and bridges through the mountains. Then he added:

"Any nation with designs on the United States undoubtedly has very accurate data on these very things I am speaking of."

So there is work to be done. Much of it isn't the spectacular kind. For example, of California's 58 armories 15 have been deemed unsafe or inadequate for storage of Federal equipment. County fair buildings may now be used for this purpose. Moffett Field, with its gaping dirigible hangar that dwarfs the puny pursuit planes quartered therein, has become a West Point of the Air just like Randolph and Maxwell Fields.

Most of the coastal defense expansion has begun in the air. This is encouraging. For the air arm strikes first—and often times hardest. But we need plenty of planes. March Field men tell us this. We need them soon. You can't maneuver "on paper" forever. We want a little hard, actual practice with *M-Day numbers.*

Our present facilities in the artillery line, such as they are, have functioned splendidly. Fort MacArthur holds the Coast Artillery Association Trophy for excellence; one of the 63rd crack units had the Knox Award for battery-fire.

The Navy already has begun to enforce the three-mile limit on strangers unwittingly (or purposefully) lingering too near the Fleet anchorage at San Pedro. Because the chance of sabotage on the oil-stores near the water's edge is indeed great.

We're getting $6,300,000 worth of aircraft sound detection apparatus for the coast. This will augment the civilian warning service (which *can* attain great usefulness) by turning mechanical ears on planes approaching within 50 miles of military objectives.

(*Continued on page 88*)

A Salute to Taylorcraft!

We extend our heartiest congratulations on Taylorcraft's splendid 1941 models and our sincere best wishes for their continued success.

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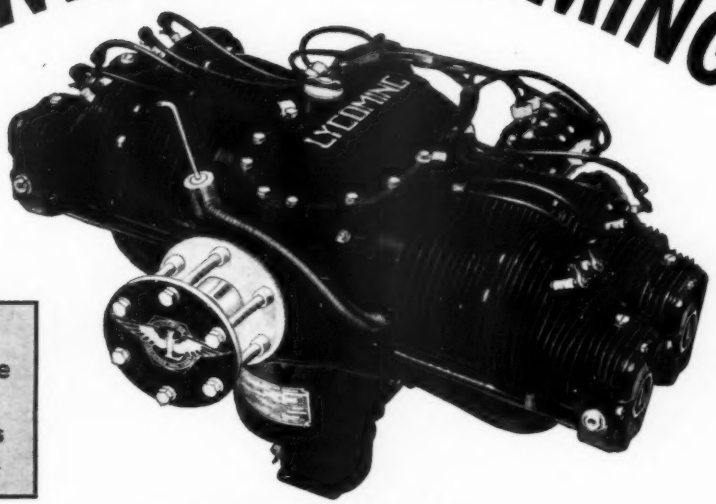

LYCOMING was the preference of 75% of the Taylorcraft Buyers in 1940

FOR THE NEW 1941

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The same sound reasons that have long made Lycoming engines the favorite in training planes of the U. S. Army and Navy underlie the preference for "power by Lycoming" shown by light-plane buyers. Last year 75% of all purchasers of Taylorcrafts chose Lycoming engines. Moreover, in 1940 more training planes in the Civilian Pilot Training Program were Lycoming-powered than all other makes combined. This year Lycoming production facilities are being increased to accommodate the swing to these "stars of the skyways" engines, as more and more pilots enjoy the *added* economy, *extra* smoothness and *proved* dependability of Lycoming engines.

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FOR MILITARY AND CIVILIAN TRAINERS ★ FOR PRIVATE AND COMMERCIAL PLANES

So You Want to Start a Flying Club . . .

(*Continued from page 23*)

can be one of the main weaknesses of a flying club; a properly-trained and regulated group can avoid accidents completely.

It is important that one individual—preferably a qualified mechanic—be made responsible for maintaining the ship in tip-top mechanical condition, even if it seems to cost a little more money. Everybody's business is nobody's business, and divided responsibility is too liable to result in a badly rundown ship.

Pick an airplane that is exceptionally safe and reliable, devoid of tricky or dangerous flying characteristics—and that means it ought to be one of the more popular lightplanes. Some of the members will fly too infrequently to be good risks in a tricky airplane.

Don't set your hourly flying rates too low, to make the proposition sound good—which is a tendency with too many clubs. It's too hard to anticipate all the expenses you're liable to meet—new tires, new windshields, new spark plugs, minor breakage, overhaul jobs and whatnot—and it is easier and much fairer to collect as the flying is being done than to assess members afterward, possibly members who have done comparatively little flying.

Practice the "three C's"—cooperation, courtesy, and common sense and induce your fellow members to do the same; the chances are that you'll have a very successful flying club.

The cheapest flying time and the club plan, run improperly, isn't always the cheapest in the end. Some fellows I know recently decided the $6 an hour rate for flying time they paid for renting a lightplane from an operator was too much and decided to organize a club. Their desire to keep the price down overwhelmed their good judgment.

They bought an old biplane, a job powered with an OX-5 engine which had seen its best days. They made no effort to set up a sound organization.

"Now," boasted one of the members to the air service operator, "Just watch our smoke. Six dollars an hour, Phooey!"

A few days after the club got the ship one member had a forced landing, damaging the landing gear. The next forced landing cost a broken prop—and that exhausted the club's ready cash fund. So a couple of members hit on a novel scheme. Another owner had a similar plane in dead storage in their hangar. They reasoned that if they borrowed the prop, he would never know. So they borrowed his prop.

All went well for the first half hour, and then they had another motor failure. The pilot, misjudging his landing, hung the ship in a treetop and it was a complete wash-out. That is, all but the borrowed prop which, by some miracle, escaped without damage. Fearful of dislodging the wreckage, the lads removed the prop, hurried it back to its rightful owner, then counted the costs.

"That 'cheap' flying time," ruefully confessed one member, "cost us just $50 an hour—and look at all the flying time we could have bought at $6 an hour for each of those $50 hours."

On the other hand, another club in the same town—the Junior Chamber of Commerce Flying Club of Youngstown, O.—flew its airplane, a Franklin-powered Piper *Cub* trainer, for more than 800 hours in a single year of operations at an average cost per hour of about $2.30, including hangar rent, full insurance, depreciation, financing charges and everything else that went with it. It also earned seven of its members—they nearly all started from scratch—their private pilots' certificates, then sold its airplane for $850 to a new club composed of 10 of its original 20 members. The writer was a member of the first club and president of the reorganized club.

The first club was a "one-year" club. That is, it was set up to operate only one year, to teach its members to fly at low cost—and it was quite successful.

Here is the financial set-up of that original club:

Each member's down payment for plane	$ 23.00
Each member's assessment for insurance	7.00
12 months' dues at $4.55 a month	54.60
Assessment for overhaul job	4.00
50 hours flying time at $1.50	75.00
	$163.60
Refund from sale of plane and division of assets	53.15
	$110.45

So the club cost each member an average of only $110.45 for an average of 50 hours of flying time, exclusive of the $3 an hour paid for instruction—or a savings of $3.70 an hour from the prevailing flying time rate. Not the slightest breakage marred the club's first year—which may be charged up to excellent supervision.

Ten members bought out the ship by adding about $52 to their refund, making their investment about $105 which covered the cost of the ship and full insurance. Now the only charge to members is one-third the usual rate, or $2 an hour to cover gasoline and oil, hangar rent, maintenance and other expense.

The club's membership includes a sales manager, civil engineer, high school football coach, physician, newspaperman, coal dealer, soft drink distributor, furniture store proprietor, bank clerk and a warehouse employee.

One of the most highly successful clubs is the Falmouth Flying Club of Hatchville, Mass., which has flown 2,500 hours in the last two years without even the most trivial accident. This club owns two ships.

This club had a really small beginning, starting with 20 members who paid in $20 each as a down payment for a second-hand 40 h.p. *Cub*. Besides that, they paid $2 each month as dues and $2.50 an hour for solo time and $5 an our for dual. Its membership grew so rapidly it acquired the new planes. This club now sponsors a New England flying club meet each year, its first in 1939 attracting representatives from 14 flying clubs and last year it attracted 50 licensed pilots—members of clubs.

So you still want to organize a flying club? Then your first problem is to bring together the membership, a group of people from all walks of life joined together by the common desire to fly. The next problem will be a constitution and by-laws, then in filling up your membership. A most satisfactory method of handling admission is by issuing a number of shares equal to the number of members, each share being valued at (if there are 20 members) one-twentieth the value of the plane. Each member should be charged

(*Continued on page 82*)

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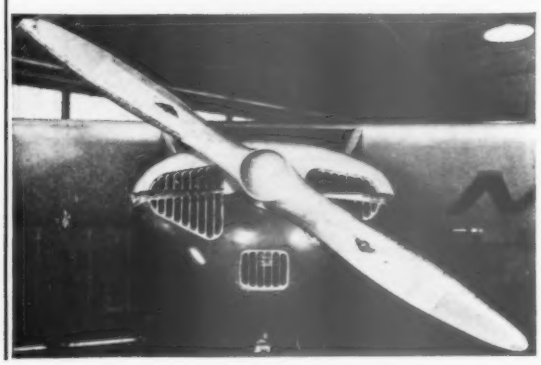

THE AMERICAN'S CREED

A Summary of American Civic Faith

by William Tyler Page

I believe in the United States of America as a government of the people, by the people, for the people; whose just powers are derived from the consent of the governed; a democracy in a Republic; a sovereign Nation of many sovereign States; a perfect Union, one and inseparable; established upon those principles of freedom, equality, justice, and humanity for which American patriots sacrificed their lives and fortunes.

I therefore believe it is my duty to my Country to love it; to support its Constitution; to obey its laws; to respect its flag; and to defend it against all enemies.

THE B. G. CORPORATION . . . . . 136 WEST 52nd STREET . . . . . NEW YORK, N. Y.

A copy of The American's Creed and The Story of The American's Creed, (see overleaf) suitable for framing, will be sent upon request.

The STORY of THE AMERICAN'S CREED

THE idea of laying special emphasis upon the duties and obligations of citizenship in the form of a national creed originated with Henry S. Chapin. In 1916-17 a contest, open to all Americans, was inaugurated in the press throughout the country to secure "the best summary of the political faith of America." The contest was informally approved by the President of the United States. Through Mayor James H. Preston, the city of Baltimore, as the birthplace of the Star-Spangled Banner, offered a prize of $1,000, which was accepted, and the following committees were appointed: A committee on manuscripts, consisting of Porter Emerson Browne and representatives from leading American magazines, with headquarters in New York City; a committee on award, consisting of Matthew P. Andrews, Irvin S. Cobb, Hamlin Garland, Ellen Glasgow, Julian Street, Booth Tarkington, and Charles Hanson Towne; and an advisory committee, consisting of Dr. P. P. Claxton, United States Commissioner of Education, governors of States, United States Senators, and other National and State officials.

The winner of the contest and the author of the creed selected proved to be William Tyler Page, of Friendship Heights, Md., a descendant of President Tyler and also of Carter Braxton, one of the signers of the Declaration of Independence.

From the CONGRESSIONAL RECORD

The complete proceedings in regard to the official acceptance of The American's Creed may be found in the Congressional Record, No. 102, April 13, 1918, from which is taken the following explanation of the doctrinal origin of the creed:

"The United States of America."—*Preamble, Constitution of the United States.*

"A government of the people, by the people, for the people."—*Preamble, Constitution of the United States; Daniel Webster's speech in the Senate, January 26, 1830; Abraham Lincoln's Gettysburg speech.*

"Whose just powers are derived from the consent of the governed."—*Thomas Jefferson, in Declaration of Independence.*

"A democracy in a republic."—*James Madison, in The Federalist, No. 10; Article X of the amendments to Constitution.*

"A sovereign Nation of many sovereign States."—*"E pluribus unum," great seal of the United States; Article IV of the Constitution.*

"A perfect Union."—*Preamble to the Constitution.*

"One and inseparable."—*Webster's speech in the Senate, January 26, 1830.*

"Established upon those principles of freedom, equality, justice, and humanity for which American patriots sacrificed their lives and fortunes."—*Declaration of Independence.*

"I therefore believe it is my duty to my country to love it."—*In substance from Edward Everett Hale's The Man Without a Country.*

"To support its Constitution."—*Oath of allegiance, section 1757, Revised Statutes of the United States.*

"To obey its laws."—*Washington's Farewell Address; Article VI, Constitution of the United States.*

"To respect its flag."—*National anthem, The Star-Spangled Banner; Army and Navy Regulations; War Department circular on flag etiquette, April 14, 1917.*

"And to defend it against all enemies."—*Oath of allegiance, section 1757, Revised Statutes of the United States.*

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New Eagles for the Army

(*Continued from page 16*)

French aircraft inspector, Paul Chemidlin, whose presence aboard an allegedly secret American military plane precipitated a bitter debate in Washington. None of the actual entrants won the contest. Douglas did, although the company was unable to send a ship to Wright Field. Its engineers, instead of attempting to rebuild the DB-7, designed a vastly superior model which won Army approval. This is the A-20A. At the same time they turned out a couple of other modifications of the DB-7 to the orders of the French and British purchasing commissions, known as the DB-7A and B.

All are 8½-ton, tricycle-geared, high-winged, twin-engined monoplanes, with a span of about 60 feet. The DB-7 and 7A are fitted with engines in the 1,000 h.p. class; the 7B and the A-20A, which differ from each other in other respects, are powered with *Twin Cyclones*. The DB-7's top speed is just over 300 m.p.h., the 7A about 315, the 7B and the A-20A about 350 just above 15,000 feet. Originally the A-20A was to have been equipped with turbo-superchargers which would have sent it through the air at 390 m.p.h. at 25,000 feet. But it is said that not enough of the new type blowers are available and that plans for their use in the A-20A have been abandoned. The whole series make acceptable reconnaissance craft and multi-engined fighters as well as the ground attack planes originally intended.

The radius and bomb load of these planes, when equipped for bombardment missions, are not great, as is to be expected: 500 miles and 1,000 pounds. The British versions of this series have been criticized by the British themselves because the fuselage is too narrow to permit side-by-side seating of the pilot and the bombardier-co-pilot. The fuselage was made as narrow as possible in the interest of speed.

The dive bombers—the SBD-3 (A-24), and the XSB2C-1—both are Navy types to be adapted for Army use. Less than a hundred of the SBD-3s have been ordered. The order was placed by the Navy, from which the War Department will buy its dive bombers. The number of XSB2C-1s to be procured is not as yet known. Both are single-engined, low-winged monoplanes, the SBD by Douglas, the other by Curtiss. The Curtiss is the newer. The Douglas divers are actually the third in a series, the first two models of which were for the Navy exclusively. Production of the first of the series has already been completed. The Curtiss, successor to a long line of Curtiss biplane dive bombers (the famous *Helldivers*), is not yet in production.

They are both quite small as they were built originally for operation from aircraft carriers. The Douglas's top speed is about 275 m.p.h. and it is driven by a Wright *Cyclone*. The somewhat larger Curtiss is *Twin Cyclone*-engined and approaches 300 m.p.h. Bomb loads: 1,000 and 1,500 pounds respectively. The differences between Army and Navy versions are relatively slight, the main ones being the elimination of deck-landing and emergency flotation gear from the Army models.

At first glance these speeds do not appear impressive. It must be remembered, however, that top speed has to be sacrificed in this class of ship to flaps and other essential diving brake equipment. Contrary to the general impression, high diving speeds are undesirable as an unnecessary strain would be placed on ship and crew and the pull-out would have to begin at too high an altitude. Diving speeds of around 300 m.p.h. are preferable. The Junkers Ju-87, Germany's famed *Stuka*, is a single-engined ship with a top speed of less than 250 m.p.h.

"I assure you, Mrs. Van Ripsnort, that this is as much a surprise to Rhodes Brothers as it is to you! . . ."

Air Corps pursuit squadrons should provide not only ships with exceptional speed and heavy armament, but also some with range enough to accompany bombers on relatively close missions. Escorting bombers on long distance raids is theoretically desirable but at present is entirely out of the question. Without any intention of taking sides, it must be reported that a series of torrid disputes has been raging over whether all the new fighters measure up to these standards in every respect.

In service in the largest numbers so far is the Curtiss P-40. Coming into service now is the P-46, a slightly modified P-40. Most unorthodox is the Bell *Airacobra* (the P-39), and most spectacular is the twin-engined Lockheed P-38. The P-47, the Republic entry, is a newcomer and is still a fairly long way from quantity production. The P-47 is a low-wing monoplane, but, unlike the others, is powered by an air-cooled radial, the 18-cylinder Pratt & Whitney *Double Wasp* (1,850 h.p. for take-off). Its speed is over 400 m.p.h. at 30,000 feet (it has a turbo blower), but falls off rapidly to under 350 at 15,000 feet. Armament not released. All Air Corps pursuit types but the P-47 also are on order for the British.

The P-40 is the successor not only to the Curtiss P-36 but also to the YP-37, the first high performance American fighter designed for the installation of a liquid-cooled in-line engine—the Allison, of course. The Allison's 1,000 h.p. at full throttle gives the P-40 a speed of about 365 m.p.h. and the cleaner P-46 perhaps 380.

The original armament of four rifle-caliber machine guns is believed undergoing change, as four guns are not now considered adequate. British *Spitfires* and *Hurricanes* have long had eight, the *Hurricane III* has 12 and the new British fighters with 2,000 h.p. motors (the *Tornado* and *Typhoon*) eight machine guns and four 20 mm. cannon.

Larry Bell's nine-ton multi-engined *Airacuda* fighter, with its pusher propellers and other unusual features, four years ago led the aviation world to expect the unorthodox every time he produced a new ship. The P-39 is no disappointment on that score. It is a low-wing, monocoque monoplane, which is not at all unusual. It has a tricycle landing gear, which is no longer unique. But the Allison engine is in the rear and its tractor propeller is turned by a long drive shaft which passes beneath the pilot's feet. The pilot sits on the front end of the gear-box. By this strikingly different arrangement, several weighty advantages are gained. The British, however, who have roasted the *Airacobra* in their technical magazines, claim that a number of disadvantages also result.

Because the engine, the greatest mass of weight in the ship, is nearer the center of gravity and center of pressure, the P-39 is more maneuverable than might be expected of a ship of its speed or high wing-loading. Getting the engine out of the nose also permits the installation of more and bigger guns right in the nose, within reach of the pilot. Guns do not jam often today but, when they do, the pilot appreciates easy accessibility. Installation of a nose wheel for the tricycle landing gear would have been more difficult in a conventional machine.

The rear engine offers a certain amount of protection to the pilot from behind. The radiators for a liquid-cooled motor must be immediately adjacent to it. Placing the radiators aft of the cockpit, as in the *Airacobra*, reduces drag not only by making possible a cleaner nose but be-

(*Continued on page 81*)

Pilot With an Idea

(*Continued from page 29*)

thing—more regulations. The way to keep additional ones from being written is to obey the present to the letter. And what's more, practically every accident which occurs to aircraft today *is directly preceded by a violation* whether it is a simple case of failure to make proper inspection of some part of an aircraft or engine or a violation of some flying regulation. With more and more traffic, there must be greater care, or today's regulations are going to seem like an introduction to the main body of future rules."

Steele, since abandoning professional flying—included in his log book are 6,700 hours of airline flying over two continents, not only has kept abreast of new regulations but has issued a supplement containing 177 C.A.B. questions on Chapter 60 of the C. A. R. which must be answered by all pilots before they solo. Twenty of the 177 are chosen for the examination. The answers are found in the Aid to Pilots handbook which he has compiled.

"I suppose," Steele says, "that I ought to be out flying instead of fooling around with the book. But somehow it's more fun when I realize that I'm doing more for aviation by working on it than by just flying. Of course, I keep my ratings, getting in enough time for that each year, but I've had to give up my professional career."

Steele first became aware of the drastic need for traffic regulation, a problem which is growing by leaps and bounds every week, when in February, 1936, he worked on the Newark Airway Traffic Control. He worked for six months training men in handling traffic on America's most congested airway. Later in July, 1936, he went to Chicago, performing the same function. And from July, 1937, until April, 1939, he worked on the same problems at Burbank, Calif.

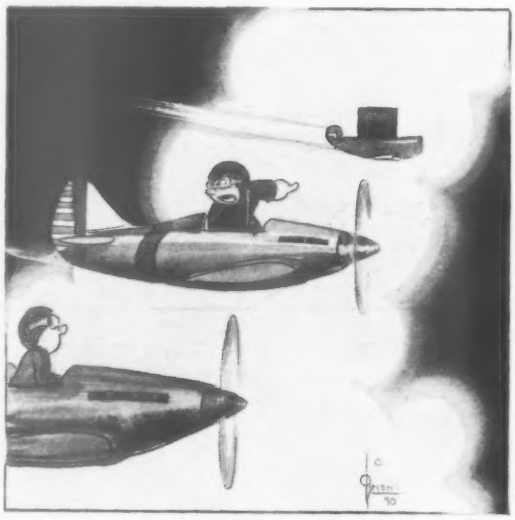
"It was in April, 1939, that I finally decided to publish the little handbook because it was obviously needed," he says. "It was a sort of public service. I thought I'd need only a few weeks, but the thing is developing a lifetime quality. I think I'll be at it forever." Steele, with the Airway Traffic Control experience behind him, is probably the best man in the country for the quasi-public job. For throughout his entire career he has been untangling problems. Until today he has usually got things under way and then has moved along to another sphere. But this time the job has him.

Steele was born January 1, 1897, at Detroit Lakes, Minn. His father was a large-scale contractor for railroads and he built practically whole towns. Earl went to school at Moscow, Idaho—that is, high school. At that early age he worked his way through because he was a 'teen-aged genius at mechanics. He could repair anything from a tractor to a harvester. When mechanical jobs failed to develop, he harvested or turned woodsman. When he was still in high school in 1912, a pilot flew a pusher to town. He allowed Earl to sit in the seat and give "educational" talks on the principles of its operation. From then on he was a convert to aviation.

"I swore," he said, "that some day I'd have one of those things in the air."

When we entered the World War he couldn't get into the Air Corps. He had to be content, like many another fellow of that period, to do something else. So he enlisted in the motorized artillery. Immediately after the war, in 1919, the late Earl Daugherty, of Long Beach, Calif., barnstormed Texas. Daugherty agreed to teach Steele to fly in exchange for mechanical and general services. He turned him loose in three hours and 15 minutes.

"But I didn't know how to fly," he says.



"There goes Joe, showing off in that Link Trainer again! . . ."

"That's another reason I like the regulations. The beginner today must have a minimum of eight hours, no matter how good he or his instructor thinks he is."

From 1919 until 1923 Steele was in and out of aviation. He barnstormed in a ship of his own, turned automobile mechanic, sold automobiles, made and lost a lot of money. Then in 1923, he decided that he'd make airplanes earn a living for him. He came to Los Angeles and settled on Western Avenue, site of the old Burdette and Eagle airports. That lasted for a while, but having a pioneering spirit he started his own field between Watts and Compton, not far away. In December, 1926, he bought his first Alexander Eaglerock biplane. Unfortunately, Jack Frye and Paul Richter beat him to the Southwest franchise for the planes by 15 minutes—that is, from his viewpoint anyway. Earl decided that he could improve on the Eaglerock.

"They had a long-wing job and a short-wing job," he relates. "I went to Denver to show 'em the combination—long upper and short lower. At first they didn't believe me. Soon they were selling more combinations than either of the other types." He cast his lot with Eaglerock. During 1926 and 1927 he handled the Kansas territory, locating at Dodge City. He had three nice new ships in the hangar one day.

"And along came a cyclone and washed 'em all out," he says. "Out of the wrecks I salvaged one motor. I got a ship for it on credit and guaranteed to pay $500 a month."

It was during this period that he embarked on a "side" endeavor which made a net of several hundreds of dollars for him and possibly subconsciously suggested Aid to Pilots in later years. When the Department of Commerce first began insisting on licenses and examinations he had answers to the test questions mimeographed. He sold several thousand copies of these. They were greeted with cheers by perplexed and bewildered pilots who had never known any rule except that "if an airplane looks like it'll stay together, fly it." In some dusty hangar you might still turn up a dog-eared, Aviator-Mechanics' Handbook.

After the cyclone, Steele expanded. Before long he was in charge of both Kansas and Nebraska, for Eaglerock and was collecting $300 for a nine-hour instruction course, including one hour of solo. Then he began a career of "starting" things. Whenever Steele came around, wheels started turning and airplanes began to fly, usually with him at the controls.

In July, 1928, he started the Chicago-Cleveland run of Universal Airlines. In December, 1928, he worked for Frank Robertson, flying between St. Louis and Chicago. Four months later he was inaugurating the St. Louis-Kansas City-Omaha night mail run. And in the summer of 1929 he went up on the Chicago "We Will" endurance flight and stayed aloft for 391 hours and three minutes. John Hunter was the other pilot and Russell Mossman refueled. Late in 1929 he went with Pan American, flying from the United States to Cuba and San Juan, Puerto Rico. In the spring of 1930 he worked the west coast of South America with NYRBA and remained until August, when Pan American bought out that line. In September, 1930, he was helping Ludington fly from New York to Washington "every hour on the hour." He remained with Ludington until 1933 when the company was bought out by Eastern Air Lines. Then he helped start the Boston and Maine Airline with Paul Collins in November, 1933.

"And at about this time I'd had every kind of experience from barnstorming and making endurance flights to operating airlines over every kind of terrain under all

(*Continued on page 88*)

"IF WE COULD TALK FACE TO FACE...

..I'd tell you some things about aviation you don't read in newspapers. For instance, while billions are being spent for military aircraft the really big news of the industry is *aviation's expansion for peace*. Airline orders for new equipment and increasing employment are breaking all records. Production of light planes is zooming into the thousands where hundreds were built before. Factories can't get enough engineers. Commercial operators can't find sufficient capable pilots or mechanics for their expanded operations. The national pilot training programs are creating a mammoth future market for airplanes. Thus through *expansion for peace* new jobs by the thousands are available. And each job can be a stepping stone to a life career if you have proper and adequate training. We at Ryan have devoted 18 years to perfecting that kind of instruction. The record of our graduates in every branch of the industry proves that Ryan training pays big success dividends. Why not get all the facts?"

T Claude Ryan

President, Ryan Aeronautical Co.

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MECHANICS
- ○ Master Mechanics
- ○ Sheet Metal-Riveting

Big Base

(*Continued from page* 21)

These men have been aviation boosters since, and have supported—nay, demanded—steady improvement in Milwaukee's facilities and services. And the Government's pilot training program brought actual flying instruction to many of the local citizens.

"But," says T. F. Cosgrove, airport engineer, "Hitler really clinched the job."

There were other factors, of course. The national defense program and the publicity it got; the typical editorial attitudes of the local newspapers; increased use of air mail and air express—these all contributed to the inroads aviation has been making in the consciousness of the country and of Milwaukee County, in particular. At any rate, three years ago the county applied to the Federal Government for WPA allotments to help finance the building of a modern airport. Funds were forthcoming.

Maj. Stanley E. Piasecki, who has managed the airport for 12 years, and Engineer Cosgrove knew what they wanted. They presented their plans for an administration building that would be large but unpretentious, and for runways and lighting that would be adequate but inexpensive. The whole airport is built in such a way that it can be expanded almost without limit with a minimum of cost. This is one community that didn't, because of the Washington treasury, fling itself headlong into debt to have the most outstanding airport in the country. But it did build itself one of the most modern airports. Take a look at the administration building. The ground floor has many-windowed offices for the operations departments of the two airlines. It has an office from which airplane operations are controlled visually by lights and a control table for the runway lights. There is a modest restaurant seating 72 persons and a comfortable lounge for men and one for women. There are offices for postal facilities and officials.

The second floor is given over entirely for office space. Here is the inspection department of the C.A.A. and the communications room, as well as the weather bureau. Additional offices are equipped by airlines and a number left vacant for future use as increased business—which will surely come—warrants their use.

Surmounting the whole structure is a control tower larger than that at La Guardia Field. This tower will be vacant until the airlines decide they need it. Then the county will gladly let them buy and install the radio equipment required and hire the operators. No concessions are farmed out. The county owns and operates the restaurant, the news stand and the hangars. The county sells all the gasoline and the oil. In July it had a total income of $1,840.86 as against gross expenses of $2,026.09. That made a loss of only $185.23. The new administration building was put into use August 15, so that income will increase greatly while expenses will make only a slight rise. Major Piasecki expects a loss of $125 for August, and after that to whittle down the monthly loss until the airport will be operating in the black by the first of 1941.

An average of 35 planes a day nest at the Milwaukee County airport. The 15 individual hangars now on the field will soon be augmented by another 10, renting for $10 apiece. Compared with much publicized ports like La Guardia Field in New York and the new Philadelphia aviation center, the finances of the Milwaukee field sound like a schoolboy's budget. But the flatfooted economy of midwestern farmers and small industrialists has produced a landing field comparable with the lavish terminals though rooted in a financially sound base.

For example, Engineer Cosgrove priced light control boards which would automatically illuminate the runways at the approach of an airliner and which would produce the lights in miniature on a small-scale reproduction of the runway system. He found the charges for such a machine ranged from $1,200 to $1,500. So he built one himself for a few hundred dollars.

"I just came out to check her and there they were!"

Increased use of aviation facilities has come to Milwaukee rather through a process of evolution than of growth. In 1938 only Northwest Airlines operated through Milwaukee, on its route from Chicago to Seattle via Minneapolis and Fargo. There was no great demand for seats and only 200 or so passengers a month departed by air. But in that year Pennsylvania-Central inaugurated a service from Milwaukee to Detroit by way of Muskegon, Mich.

Until then, air travelers bound for Detroit or any point east has to take train or plane to Chicago and connect there for their destinations. The new service cut hours from the old. Space was so in demand that PCA soon added a second flight into Milwaukee and then a third. PCA alone now carries 1,100 passengers a month out of Milwaukee.

Harold B. Veith, district traffic manager for Northwest, says, "Our load factor is well over 90 per cent on both the north- and south-bound flights. We have to 'unable' as many passengers as we confirm space to. It has gotten to the point now where we are losing passenger good will not because of any deficiency in the service we actually provide, but because we simply don't have enough seats to accommodate them all." Northwest carries about 600 passengers a month from Mr. Veith's station.

The greatest need for additional service is to Chicago, where Northwest connects seven other airlines, and to Minneapolis. There is no immediate relief for the space situation in sight, according to Veith, unless a projected ferry service between Chicago, Milwaukee and Madison, Wis., is put through soon. Northwest, United Air Lines and TWA propose to run one roundtrip a day between those points. But the plans are still in the formative stage, and Veith believes it unlikely that this service will go into effect soon.

Milwaukee has a large population of industrial plants and these supply the bulk of passengers. Allis Chalmers, Nordberg Manufacturing Co., Perfex Corporation, Phoenix Hosiery, Nunn-Busch Shoe, Bucyrus-Erie, A. O. Smith and the Waukesha Motor Co. draw largely upon the local airlines. The active support of these industries to any improvement in Milwaukee's aviation standing is immediately forthcoming. When a Governmental committee visited Milwaukee in August to look over a site for a proposed aviation research laboratory, the members expressed amazement at the enthusiasm shown by the citizens and officials.

"We had more than 100 businessmen at the lunch as well as the governor, the mayor and the county board," Major Piasecki said. "I guess we have a good chance of getting that laboratory here." The site selected by the board of supervisors for the laboratory is at the southeast end of the field and across a highway.

One could hardly call the Milwaukee County airport purely commercial. Milwaukee always can be found thronged with lightplane enthusiasts. Both the CAA and NYA are training pilots there and more than twenty citizens own their own craft. A fixed base operator runs a charter and sightseeing business in addition to training Marquette University youths.

Runway construction is not completed. The north-south runway, now 3,900 feet long, is being lengthened to 4,500 feet, and the northeast-southwest runway is being extended from 3,800 feet to 4,500 feet. Four 3,000 watt units at the end of each strip form a street of light on the runways for night operation.

(*Continued on page* 89)

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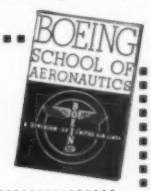

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State ..... *Age* .....

Previous Schooling .....

BOEING SCHOOL OF AERONAUTICS UNITED AIR LINES A DIVISION OF UNITED AIR LINES

Aviation Invades Detroit

(*Continued from page 31*)

interfere with normal automobile output, it may subordinate completely annual model changes for 1942. On the other hand, auto manufacturers are not ducking the responsibility and are preparing to spend plenty of time and money to make a success of it.

Independently of this industry-wide bomber program—which is expected to see everything but final assembly done in automotive plants—three leading body manufacturers—Briggs, Murray Corporation of America and Fisher Body Division of General Motors, are preparing facilities for production of nearly $75,000,000 worth of subcontract work from the Douglas Aircraft Company, setting up an eastern procurement office in Detroit which ultimately will have a staff of more than 25 engineers, inspectors and traffic men. Heading the nucleus of the staff already in town are Fred Essig, a veteran aircraft production and procurement engineer, and Fred Rockelman, a newcomer to Douglas who has held high positions in the automotive industry.

While no information has been released on the Briggs and Fisher assignments, it has been established that Murray is to fabricate inboard wing sections for 1,700 Douglas A-20A twin-engined attack bombers. Murray organized an aircraft division last July, headed by Richard C. Gazley, for 13 years head of the technical development section of the Civil Aeronautics Authority and predecessor bureaus. It now is working on a small educational order of vertical stabilizers for the Brewster Aeronautical Corporation by way of training personnel and breaking in equipment.

Briggs likewise set up an aircraft division in July and placed Ben Jacobson, former general manager of Barkley-Grow and a veteran of the Stinson organization, in charge. Brig.-Gen. W. E. Gillmore, former assistant chief of the Air Corps, was engaged to do liaison work. Briggs now is making deliveries on an order of outer wing sections for Vought-Sikorsky. Each plant is completing preparations of more than 500,000 square feet of plant space for aircraft work.

The automotive industry is not deluding itself as to the complexity or magnitude of this undertaking. It freely admits that a transition to aircraft fabrication is neither a simple nor a rapid task. A spokesman for the industry states it this way:

"Entirely unlike the regular products of this industry, both in materials employed and construction methods required, this assignment places before the automotive plants a great task of adaptation at the very time the country's facilities for turning out new machines and tools are swamped under other defense orders.

"The most vital of the preparatory processes—one found to consume a considerable period of time—will be the engineering exploration of present aviation construction methods, their adaptation to the automotive facilities that will be available, and development of manufacturing plans for drawing from many plants a synchronized flow of readily assembled, matching parts.

"Apart from utilization of adaptable existing equipment, biggest automotive contribution to the job is likely to be the use of supervisory forces and manpower which, while inexperienced in aviation requirements, do possess the 'know-how' of volume production and can be trained to fresh tasks under leadership of expert men. How far automobile mass production methods can be employed remains to be worked out by engineers and production men."

It has been reliably stated that the aircraft industry is very happy to see this

"This sorta thing's been going on ever since the CAA started selling commercials . . ."

super-added procurement program shoved into automotive hands, as it will be the first phase of the production program to be curtailed when the emergency is over and the headaches which accompany closing of plants and discharge of workers will be in Detroit rather than Los Angeles, San Diego or Baltimore.

The aircraft manufacturers also are reported to feel that plant expansions already projected are as far as they feel they can go without dangerously thinning their supervisory personnel and economic position.

Much farther advanced than the structures production program—which may not get under way until next spring or summer—is the engine production effort in Detroit. Packard is spending $30,000,000 for plant preparation for the Rolls-Royce order, $18,000,000 of this sum on new tools. More than 14,000 men will be employed on this contract at peak production. The company expects to have completed 15 production engines by August, with a gradually rising output until a peak of 40 engines daily is achieved by Dec. 1, 1941.

Orders totaling $312,000,000 have been placed with Packard for the 1,265 h.p. liquid-cooled *Merlins*—3,000 engines for the United States for $63,000,000 and the remainder for England. The British hold options for 10,000 additional and the U. S. for 5,000 additional.

Ford Motor Company is throwing up steel for a $21,000,000 plant for production of 4,500 *Double Wasps*, costing $122,000,000, for the Air Corps. These are to be built under license to Pratt & Whitney for a fee of $1 per engine. Production is expected to start by May. Both companies have begun training men for these tasks, Packard through its production line for 1,350 h.p. marine engines now rolling at nearly two a day; and Ford in his trade school and machine shops.

Continental Motors Corporation of Muskegon, Mich., which, until a few months ago, was concerned primarily with production of 40 to 90 h.p. engines for flivver planes, today holds contracts for $30,000,000 worth of its own radial engine for planes and tanks and for Wright *Whirlwinds* to be built under license in Continental's recently reopened Detroit plant.

Continental, Ford and Chrysler all have high-output power plants under development which may crack the market in the near future. Continental's is a liquid-cooled V-type developing more than 2,000 h.p. and is said to be intended for the successor to the P-39 *Airacobra*, which now is on the Buffalo drawing boards.

Ford's engine is a V-type, liquid-cooled motor developing more than 1,500 h.p. and is said to involve several unorthodox features in the way of cylinder bore dimension and crankshaft construction.

Virtually nothing is known of the Chrysler development except that it, too, will develop in excess of 2,000 h.p.

Meanwhile, after many delays, General Motors has got its Allison plant to humming down at Indianapolis to the point that production of these much-maligned engines reached 263 last month and is steadily rising. Allison expects to reach 1,000 a month at an undisclosed date in 1941. Crankshafts, camshafts and connecting rods for this motor are made in the Cadillac plant in Detroit and shipped, ready for installation, to Indianapolis. The best production talent in the GM organization has been concentrated at Allison for the past six months in an effort to speed the flow of these power plants.

That, without too much detail, is the story of Detroit's role in the aircraft procurement program. There are other factors not to be discounted. Warner Aircraft is hitting full stride on subcontract work and on its own engines; Stinson is back in town after a brief sojourn at Nashville; Republic Aircraft Parts Corporation, now a part of AMC, is doing what its name implies—and literally scores of other shops are contributing their measure.

Then, too, additional engine subcon-

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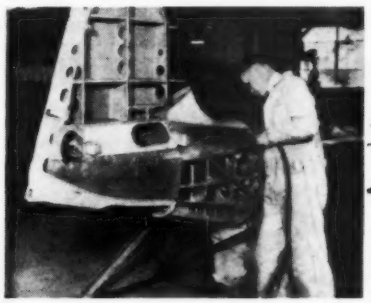

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tracts are expected by Buick and Studebaker and these may be announced before this is in print. Also in this picture is the Hudson Motor Car Company which, at the time of writing, was involved in negotiations with the Wright Aeronautical Company for production of parts for engines to be assembled at the new Wright plant at Cincinnati, and with Douglas for a part of its subcontracting work.

It is hard to stabilize the picture, so swiftly does the scene change. But here is a fleeting glimpse, for what it is worth.

END

Jobs Guaranteed

(*Continued from page 43*)

Certain rules may not be violated. The applicant must be registered with the Connecticut Employment Service. He must be unemployed. He must be mechanically inclined.

Now let us dip into the files of Vought-Sikorsky and follow the case history of a typical trainee. We'll call him John Jones. He is 22 and out of work. He is a high school graduate. He has worked at all kinds of odd jobs. He has been a grocery store clerk on Saturdays. He has pumped gasoline during the summer. He still hasn't one trained qualification to which he can point when he seeks a job at one of Bridgeport's many factories.

He is of mechanical bent. So he decides to take a crack at the Vought-Sikorsky training school. Off he goes to the state employment office. He answers a few simple questions. They throw a good deal more light on his life than he realizes. In a matter of 10 minutes, the interviewer has a fairly complete biography.

The next steps are mechanical aptitude tests. The Scovill and Quarrie, and Johnson wiggly-block tests are most commonly used. One test is simply putting round pegs in a group of round holes, designed to show whether a boy will handle tools confidently at his bench. The wiggly block is a wooden cube, consisting of nine sections with more curves than Ann Sheridan. The job is to put it together quickly. There are also written tests which sometime show a boy to be a better student of Sanskrit than an airplane mechanic. There is no place for Sanskrit in an airplane factory.

One more interview is the last step between John Jones and an appointment with the Vought-Sikorsky employment director. The state office is putting young men through these paces at the rate of 100 per day. The chat with the employment director is, of course, to determine whether the young man is the type of employe wanted at Vought-Sikorsky. If he is, he takes a medical examination. They can't take a chance on approving a boy for the course and then seeing him washed out by the medical examination. After his physical test he goes back to the employment office to get a card referring him to the trade school.

Now his actual training begins. It is a 12-weeks course but it is becoming increasingly more difficult to persuade the factory to await the completion of the course by each trainee. Workers are needed too badly. The classes are growing every day. Two months ago, 50 were enrolled. Today the 300 mark is at hand and there is no end in sight.

The class ratio is four for sheet metal, two for riveting and two for related book works. When John Jones decides, he signs the usual papers and goes to work. He makes sample gussets. He is taught to cut duralumin on a foot shear without ruining the metal or shearing off part of his hand.

What he does, he does for himself. As he enters his first class he gets a card. On it are the various steps by which he will learn to be a sheet metal worker and a riveter. He must take every one of these steps himself or he just doesn't go anywhere. As he shows the instructor a properly-completed piece of work, a check is placed against that assignment. Then he goes to the next, more difficult, task. Not that he will be a skilled mechanic or riveter when he finishes the course—no claims are made along that line. He will simply be qualified to take a beginner's job and later to become a qualified artisan under the pressure of actual shop work. He answers the crying need for men who are able to any extent to do the mechanical work required in aviation.

In his first class, he learns to drill and countersink holes. He shows the holes he drills to his instructor. If they are rough-edged or egg-shaped, he repeats the step. He learns the strengths and weaknesses of the metals which go into an airplane. He learns what a micrometer is and how to use it.

His next class is in brake forming. Bending duralumin is a tricky task. Too much stress at just one point and the expensive piece of metal is ruined. He is taught to make lightening holes and then bend the metal without any excessive strain.

In Class Three he discards the simple machinery he has used and learns to work with his hands. Gradually he has been buying tools so that, by this time, he has a well-equipped tool box. One of these tools is a wooden mallet. Like the metal-beater of ages ago, he shapes metal into all sorts of odd designs with this mallet.

Up to and through this class in sheet metal the student has been learning what the metal can be made to do and how to handle it efficiently. The next class shows him how a factory does the things he has been taught to do. He bent one piece of metal in Class Two. In Class Four he is shown how a factory bends 50 pieces just as quickly as he bent one. He works from a blueprint brought from Vought-Sikorsky's vaults. His instructor says: "Make 20 bends at this degree." The student does the work which is identical with tasks he will perform when he goes to the plant.

Riveting classes are apt to be a bit monotonous. To reduce the monotony, the sheet metal and riveting classes are alternate. This method has the added advantage of assuring that if a young student goes to work before he finishes the course, the training he has received will be rounded. The riveting classes are two. In the first class the student is taught to rivet by hand. In the second, he uses the air gun.

Every minute of the student's eight hours is occupied by hard work. As each student controls the speed of his own learning, you won't find many slackers. Of the eight-hour day, six hours are spent in shop and two with books. In the related classes the student is taught that a blueprint is a good deal more than a maze of white lines on blue paper. He is taught to sketch. He wrestles with the problems of shop math—fractions, decimal equivalents, dimensional work. He must have a knowledge of stock, the characteristics of aluminum and its alloys.

With this knowledge he is ready to become a not unimportant unit of the factory. When he finishes he gets a diploma. The employment director at Vought-Sikorsky and the school director are in constant touch with each other. So when the young man is fully trained, his teacher simply says: "Please report to work tomorrow morning promptly at 10 o'clock."

The young man goes to work as a beginner. He need not stay in this class. Rapid promotion is his for the taking. His 50-cents-an-hour beginner's wage will soon give way to 75 cents and $1.00 per hour if he proves his worth. In nearly every case, in fact in all but one of some 300, the trainees have proved their salt. Only one man has been discharged.

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Many others have progressed to the rank of lead men. One youth has become lead man in the wing shop crew—a notable achievement. With foremen directing 200 to 300 men, the lead men have immediate charge of groups of 30 and 40. Some of the men under the graduate trainee have far more shop time to their credit but do not have the foundation he acquired during his job training course. The training course has proved the solution to stalled production at Vought-Sikorsky where there are contracts for more than 1,000 Navy scout planes. Vought-Sikorsky has set an example for the rest of this key industry.

END

Passenger Haven

(*Continued from page* 40)

bious about working out the multitude of details necessary to build the type of terminal they required, but gave Peterkin the "on course" signal to start his drawings. The first sketches were drawn November 2, 1937, and some 400 followed that first draft.

It was two years before construction began. Workers moved in on the plot at 42nd street and Park avenue in October, 1939, to demolish the remains of the Belmont and to build the foundation for a building unique in air transportation. It was during this period of construction that the airlines capitalized on New Yorkers' curiosity and issued membership cards to the Knot-Hole Club. It was a promotion stunt that attracted much favorable publicity.

Between October, 1939, and January, 1940, the insurance company poured $1,000,000 into construction of the building, which was designed entirely from airline specifications. Although the terminal boasts six stories above the ground, passengers will be concerned with only two. The main hall, an elliptical-shaped room with a sky blue ceiling, is the checking-in point for outbound passengers. Here a traveler will enter on an escalator from the main entrance on 42nd street and find himself in a hall of black marble floors and pillars, golden walls and symbolic figures worked in color into stainless steel by a secret process.

The ticket counters are set back under an overhanging ceiling. They are identified only by dignified frosted-glass signs. On his right is a quick lunch counter, the only discordant note in the building. An information counter occupies the center spot in the room, and modernistic benches, built with an eye for beauty rather than comfort, sit between the information counter and the 41st street end of the lobby.

After buying his ticket and having his bags checked, the passenger strolls to the coach at the opposite end of the building from the entrance. Here he passes through a wide portal down two steps onto one of six narrow walks that separate the elevators. His baggage is already loaded in the cargo compartment of the limousine. He steps in, sits down. The dispatcher signals the coach driver; operates from his cage above the cars a mechanism that opens the doors, and the coach drives out of the building and heads for the airport.

The passenger sees his bag last when he enters the building. At that time a porter takes it to the ticket counter, where a clerk tags it and places it on the endless belt concealed behind the counter. The belt carries it swiftly, along with the bags checked in at other ticket stalls, to the mezzanine floor. Here porters sort all bags, segregating them into airline flights and send them by dumbwaiter to the proper coach just below the baggage room.

An in-bound passenger, returning from La Guardia Field, is brought by the coach to the first basement, where there is an unloading ramp, a newsstand and a waiting room, but little else. The passenger escalators up to the same entrance he used when starting his trip. Only at the main entrance do in- and out-bound passengers meet.

District traffic offices of the six airlines occupy space in the upper section of the building, as well as the reservations rooms of Transcontinental and Western Air, United Air Lines and Pan American Airways. W. S. Allen, manager of the terminal, says all office space is taken. On the opening day—January 9—412 employes of the airlines moved in. By summer the management expects to have upwards of 500 men and women working there, exclusive of Airlines Terminal employes, who number 50—including 10 information countermen, 35 porters, three doormen and two ushers. Maintenance work will be done by an outside concern.

The building is operated by the Airlines Terminal, Inc. The board of directors include president, John B. Walker, United Air Lines; vice-president, Charles R. Speers, American Airlines; Paul H. Brattain, Eastern Air Lines; Wm. F. McGrath, TWA; Charles A. Miller, Pan American. Allen, who managed the Aviation Exhibit at the New York World's Fair, is secretary-treasurer and manager.

Each of the participating airlines pays $25,000 yearly rent. According to one airline official, the transport companies could not afford to use the building if it were not for the extremely high rent paid by the newsreel theater, the amount of which is not known. The Roosevelt Hotel is operating the restaurant and bar.

For undisclosed reasons, the Terminal management and the airlines refuse to divulge their estimates of the operating costs. That they do expect costs for the first year to be higher than the combined ticket and traffic offices is no secret, but an eventual reduction is expected. The collective expenses will be prorated among the lines on the "Chicago Plan," a formula used to operate the airport building in Chicago. This means that one-third of the operating cost for each airline will be based on the number of seats operated out of La Guardia field per month, one-third on the number of passengers carried and one-third on the number of flights operated.

To travelers unfamiliar with New York, the purpose of a million-dollar city terminal, as opposed to a city airport, may be obscure. But in New York, the airlines long ago learned they could handle passengers more expeditiously by checking them in before sending them to the airport than by having them all check in at the field. It works out this way: some 70 per cent of all passengers out of New York buy their tickets and completely check in before leaving downtown or midtown New York. When arriving at the airport in the coach, these passengers board the plane directly without doing any business in the administration building. The other 30 per cent of the passengers check in at the airport. The field employes are thus freed of time formerly spent with passengers to handle other details of their work.

Due to the volume of business and the increasing scope of duties in city ticket offices, the airlines quickly outgrew the 12-foot consolidated desk they had a dozen years ago in the Roosevelt Hotel and have been acquiring individually an increasing amount of office space in the more expensive districts of Manhattan. Their solution has been to rent the new Airlines Terminal building, where they can have complete control over the space problem and, by pooling many facilities that have hitherto been maintained individually in each office, to keep the overhead down.

In spite of the priority ruling—made just previous to the opening of the Terminal—this event took place in the grand manner. A series of previews were given during December for the press, travel agents, hotel and transportation executives. Mutual Life Insurance Company tendered a formal dinner in the Terminal in honor of the airlines, with a whispered hope that palmy days had again come to 42nd street and Park avenue. Climax of this dinner was the presentation to J. B. Walker of a gold key and a tooled leather box. That was January 8.

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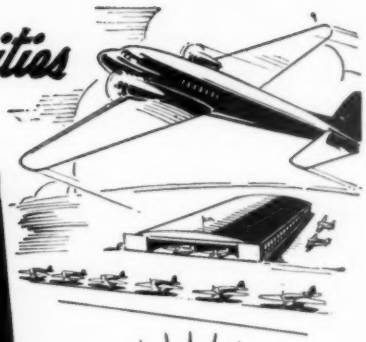

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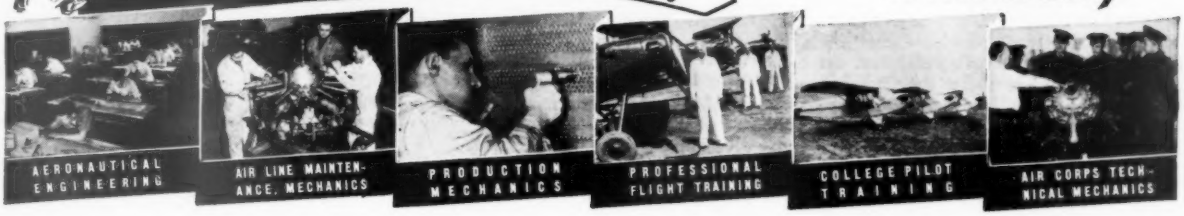

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END

I Learned About . . .

(*Continued from page* 35)

ing ship. My position was last and as the eighth plane roared away I followed as close as good judgment permitted and climbed after the others into the west. The D-12 at full throttle climbed steadily with the heavy load in the smooth air.

I leveled off at 200 feet and then began a climbing turn to the left in order to shorten distance and gain my place in the formation. Over my shoulder I could see the other ships cutting in to join the eschelon leader. Banking the ship steeper, I continued the climbing turn and angled in to reach my tail end position—near the "Walter Reed" element of an eschelon. At about 300 feet and just over the Chapman Field runway we had just cleared, I eased pressure on the controls to the right to recover from the left climbing turn. This recovery was harder than normal and I remember putting a little more pressure on the controls merely thinking the difficulty was from running into the prop-wash of one of the other planes.

For some reason instead of the usual smooth recovery there came a strong blast of wind across my face from the right which nearly tore the goggles from my head. I instinctively applied full controls to the right but to my astonishment and discomfort the violent skid increased. Realizing that something out of the ordinary was wrong, I immediately shoved the nose down—and I guess this involuntary and lucky move saved us from spinning in right there. The nose sluggishly lowered and as I realized a stall and spin were so close I kicked the right rudder full forward to the firewall. At the same time looking down in the cockpit I distinctly saw the right rudder pedal go fully forward and then hurriedly looking over my shoulder I almost chilled as I saw the rudder itself fully to the left. Looking back at the rudder pedals I saw that as my feet moved the rudder bar that the springs on the control cables extended but that the cables themselves and therefore the rudder did not move.

Locked controls flashed through my mind instantly and I turned to order Sergeant Tetu to jump but stopped as I realized that our altitude was too low for the 'chute to open. I do remember noticing that he was sitting back there looking ahead at the other ships and apparently unaware that we were in trouble. I don't know whether I decided to land the ship or whether I just sat there petrified and let some higher power do it—I do know that I tried to swallow and couldn't. Altitude less than 300 feet—ship in violent skid to the right—left rudder full on and no way of getting it to neutral—me sitting there holding the stick full forward and to the right—just trying to keep the nose down and avert what would have been a flat spin. I guess I knew even then that we were on the verge of one of those fatal maneuvers.

I felt the speed begin to build up and upon looking over the side and forward I saw we were diving straight at the Bellanca transport. This ship was running up ready for take-off but as I pulled up just above it I could see it hurriedly unloading soldiers who were waving frantically and running for cover—if there was cover. We zoomed over the Bellanca—barely missing the high wing—and using the excess speed gained in the dive climbed until the ship had to be nosed down again to avert another stall. We then went into a skidding, diving turn to the left. Sometime try to go in some other direction with the rudder locked to the left. I eased the throttle back and experienced a wave of exhilaration as the skid decreased. Altitude now less than 200 feet—something had to be done quickly as there was not sufficient altitude to dive again for excess speed for another climb.

It seemed years were required to circle the field to the left and even now I don't know whether I made the decision, lucked into it or just said: "Here, Lord—I've done all I can—you take it." However it happened we came heading into the field cross-wind—the wind from the right and the ship drifting downwind to the left but skidding to the right due to the full left rudder. Correcting for this drift, I lowered the right wing into the wind and then as the ship commenced to go straight I reduced the throttle to the closed position and glided in with the right wing sharply down. Just before the wing would have hit the ground I got it up and we dropped in roughly but all in one piece.

The ship was trying to turn to the left. The following few seconds were really full moments in my life as I fought to keep that ship from ground looping. With pressure on the right brake to compensate for the left rudder that was locked on we finally rolled to a stop. Right then I distinctly remember being able to swallow for the first time since the take-off. As I gunned the ship to try to taxi it would only loop to the left. There to the east was the sun not yet entirely risen from Biscayne Bay. To me it seemed years since that same sunrise had commenced and yet my log book indicates the entire experience occurred in less than five minutes.

I climbed out and sat on the good, solid earth and patted it affectionately with my right hand—that is, I tried to pat it. You see my pat was more or less a rub—for I had begun to shake. About then the others on the field began to arrive by way of the crash truck. It seemed as though they had at first considered my escapade as a farewell salute, buzzing the field, but after their observance of the succeeding wild gyrations aloft it had finally occurred to them that something was amiss. We soon found what it was.

A bushel of empty shells was in the empennage section of the ship. Inspection plates removed from the tail section of the fuselage showed an accumulation of empty .30 caliber machine gun shells. These had formed in the extreme tail of the ship due to the malfunction of the rear gun receivers for empties. Empennage full of brass and one shell case had become wedged in between the rudder cable and the pulley—hence the locked rudder. The action of the ship in the air had been caused mainly by the locked control but was aggravated by the added weight of the empties so far back of the center of gravity of the plane. Add to this the fact that the ship was carrying a full military load plus baggage and there's no wonder I had trouble in getting the nose down.

A thorough inspection completed—one that I should have made before the flight—and in 10 minutes, with my shaken nerves under control, I took the ship up for a spin test—of course less baggage and passenger—and brass. Needless to say I climbed higher than 300 feet before I spun that ship.

Loaded again and this time off in a more normal manner I soon reached Jacksonville where I found that the eschelon leader had been "cussing" me all the way up the coast as "just another green pilot that had to show off." In formation and off over the swamps of south Georgia I looked at the sun and was happy to feel it. I toyed with the near fatal piece of twisted brass in my hand. Looking at it and going back over the vivid events of that morning I realized that I had seen a sample of what carelessness will do. Just how small a mistake can cause a crash—just how thin the margin is between "almost crashed" and "crashed"—in reality just what negligence will do. It may take a few minutes more to check things thoroughly but care like that will pay big dividends in the end.

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as "hearsay evidence" in court—listen to it but do not admit it. Check the ship yourself and check it thoroughly. Your life and the lives of others may depend on the finding of a piece of twisted brass such as mine. It looks like empty shells might fall in the same category as "unloaded" guns—dangerous.

END

Smart Sergeant

(*Continued from page* 41)

during his years of puttering with aircraft power plants at Langley Field that Sergeant Gray began to turn over in his mind an idea for a fuel pressure regulator that would eliminate vapor lock. He took a few days' leave and thumbed a ride in an Army plane to Wright Field. There he showed a sketch and described his brainchild to Air Corps engineers and technicians who for years had been seeking an answer to the problem of vapor lock at high altitudes.

When Sergeant Gray had told his story it was decided that he should be transferred to Wright Field and be given free rein in the power plant laboratories to develop his idea into a workable system. On January 7, 1935, Sergeant Gray left the 16th Aero Squadron at Langley Field and reported to the power plant lab at Wright.

What an opportunity! To work in one of the finest laboratories in the world with almost any tools he needed and any materials he might choose available. And if he came up against an engineering problem which stumped him, he could consult with the best engineering brains of the Air Corps. He went to work in typical mechanic style. He built his experimental model up piece by piece, turning out parts on the lathes and fitting them together. Blueprints? They were to come later after he had produced his workable model. His only original blueprint was his crude sketch and the idea in his mind.

Build, discard and build again—that was the story of five years. But each discard was a little closer to working out than the one which preceded it on the junk pile. And as he worked the original concept broadened to include the entire fuel system which has now been developed.

Far too many times the original inventor of a development such as this gets lost somewhere in the shuffle and another or several others go on to reap the benefits. Not so in this case, however. Sergeant Gray's patents are protected and one of the largest manufacturers of hydraulic fuel pumps, Pump Engineering Service Corporation, better known to aircraft manufacturers as PESCO, has purchased the rights to manufacture under them. Presumably he will benefit materially from his new development which has important commercial potentialities for high altitude airliners as well as for high flying bombers and pursuit planes.

The enthusiasm and extra effort which Sergeant Gray put into his work won him many friends at Wright Field. Guards tell how he returned almost nightly after the field was officially closed and put in long extra hours alone in the engine test laboratory. Seldom were there any weekends in his weeks. The only difference to him was that he worked by himself on Saturday afternoons and Sundays instead of in a crowded lab—but he kept on working. Finally he began to approach the ideal of an efficient system which he had set and then his working quarters were more crowded as other engineers watched demonstrations and congratulated him on his achievement.

Last November he was promoted to the rank of Technical Sergeant in recognition of his success. That was after he had gone to his engineer associates to have them make drawings of the new system. It seems somewhat ironical—to reproduce the original model in a set of drawings that could be followed by other machinists in building uniform mass production units was beyond his technical skill. All he could do was to originate the fuel system.

He is staying on at Wright Field working on some more ideas for fuel pumps of smaller displacement. His fuel pump is the only invention he has developed. He is married, has two daughters and a son. One of the daughters is going to college. And the whole family is very proud of the head of the house. For Secretary of War Woodring wrote:

"It is upon men like you that the finest traditions of the Air Corps have been established. You are a credit to the service in which you are enlisted. I am certain that your service record will be an inspiration to other men who are likewise enlisted in the service of their country."

END

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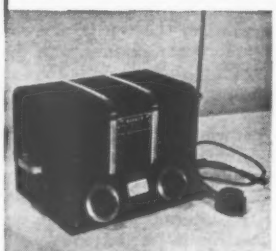

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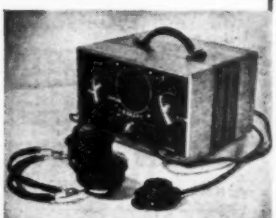

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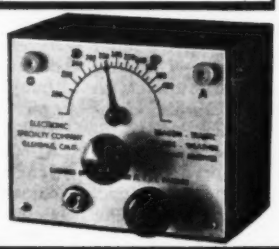

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Want a Job?

(Continued from page 56)

our advertisements regularly, you'll see many opportunities for correspondence courses. You might write the Civil Aeronautics Board in Washington, D. C. They'll be glad to send you the requirements for an instructor's license.

J. L. W. See last month's column. Your drawings are very good, and if you were in a city where aircraft plants were located, you might be able to secure employment as a draftsman.

H. S. and F. A., Stillwater, Okla. Welders are a very ticklish subject. We are running a canvass on them and will try to answer your letter next month. Unless you have Army and Navy certificates, it will probably be very difficult to find employment in the aircraft industry.

E. E. S., Comanche, Tex. We don't think you would have much trouble. Electricians are in demand. You couldn't, however, expect to get a job at a distance from the factory to which you were applying. Many electricians are on hand in the centers of aircraft production. They'll get the jobs.

* * *

According to recent advices, Henry Ford has opened a school at his River Rouge plant for the training of aircraft engine mechanics. Those of you who are possessed of experience as engine mechanics, should contact his school by addressing it in care of *Flying*. Apparently, it endeavors to train aircraft mechanics so that an ample supply will be available when Mr. Ford's factory opens next spring. Persons selected are those who are accustomed to working on automobile engines. If you live very far away from Dearborn, Mich., you will probably be at a disadvantage. Mr. Ford and his organization, however, are genuinely interested in training young men in mechanical trades. This is well worth looking into.

A. S., Elkhorn, Wis. Aircraft sheet metal hand formers are usually men with long, grey beards. Aircraft sheet metal machine operators, on the other hand, are made by taking a six weeks' to two months' course. Though you say you have a non-communicable disease, this probably would make it impossible for you to get employment with any of the major companies. If you were working for them they would be responsible for you. So, if anything happened to you, they might be subject to a lawsuit. We do not think that your chances are very good and, so far as your ability to run an "ice cream machine" is concerned, we do not believe that it will help you.

* * *

And now, the ladies! We have a letter from E. S., of Hallock, Minn. The same limitations apply to women as to men. A good stenographer—if she is in the vicinity of the company to which she is applying for employment—stands a fair chance of getting herself hired. From a distance, though, she is operating under the same disadvantage as her male competitors. Getting a job with an aircraft factory—or airline—is no different than securing employment with any other business concern. And any experience which she may have had in the building of model aircraft will not appreciably help her. A successful employment record in business will naturally aid her in securing employment, although she is at no greater advantage than any other woman who can efficiently perform the mechanics of typing and shorthand. All women who have written in to this column must bear this in mind. Unless, of course, they have a specialty such as dressmaking! (Which may sound absurd, but isn't. They use this particular skill in covering airfoil surfaces.) Or the operation of some highly specialized business machine. Stenographers, as we have said before, get jobs in the aircraft industry in precisely the same manner as they do in other businesses. Employment managers will not, of course, hire a stenographer who lives in a locality remote from their factories, if they can hire one of equal ability who lives close by.

Women *specialists*, however, do have their place in the aircraft industry. They should therefore contact the personnel manager of the nearest aircraft factory to the vicinity in which they live. They may get a job.

* * *

D. F., Bozeman, Mont. You don't seem to have any specialty. If you are trained in one, you might apply in person to your nearest airline. You'll have to make up your mind as to what you want to do, and head for it.

G. V. G., Mansfield, O. You should have a good chance of getting employment. You seem to have had the experience that aircraft plants require. Don't, however, abandon any employment you have at the present time. Good die makers usually command high wages in the aircraft industry, though.

We have had several questions about lightplane manufacture. We have written the various firms who make lightplanes. All of you who are interested in this field had better wait until our next column. We believe this business will prove extremely interesting. Hang on and we'll try to analyze its possibilities for you.

R. H., of Rochester, Penn., writes that he is experienced in the repair of automobile and motorcycle engines. He has been employed by an automotive repair service for four years. Aircraft engines are different, though. They require a specialized knowledge. R. H., J. M. and several others who wrote in have had an advantage in that they are experienced with the repair of motors that are almost identical to the internal combustion engines used in aircraft.

Engine companies are eager to find men who know this trade. New men may have to work as apprentices, but there is definitely a place for them. We suggest that you contact the Pratt & Whitney Aircraft Manufacturing Company in Hartford, Conn. You live near their plant. Also, many other companies located in your part of the country employ machinists. Perhaps you can get jobs as installation mechanics in some airplane factory.

Next month the party's on you! We still insist, incidentally, that the clerical end of the aircraft industry—manufacturing, operations and sales—should be covered pretty darn' soon. Make it easy on yourselves, though. You're the doctors. . . .

END

New Eagles for Army

(Continued from page 67)

cause obstructions near the tail of a ship offer less resistance in themselves.

The most serious criticism of the *Airacobra*, as charged by the British, is that its rear engine very simply means more dead pilots. It is feared that the engine will keep on going in the event of a crash and crush the man unlucky enough to be in the cockpit at the time. Fear of this sort of occurrence was one of the factors in the general abandonment of the pusher engine a generation ago.

In such ships as the *Airacobra* the engine itself is also more exposed to bullet damage. Most enemy bullets come from the rear because most dog fights are fought head-on-tail. Unfortunately the liquid-cooled engine's cooling system is vulnerable. Loss of coolant and consequent seizing of the engine is a leading cause of losses in the war. The only way to shield the rear engine is to provide special armor. A small pursuit ship, however, can ill afford all that extra weight.

Too, the front of the cockpit of the *Airacobra* must be plated to protect the pilot. The nose gun arrangement is not considered particularly advantageous in any case by armament experts, who prefer to locate the guns in the wings outside the propeller disk altogether. Higher rates of fire are thus possible. The last word in this dispute will not be had until British *Airacobras* go into action with the R.A.F. and it is possible to compile a won-and-lost tally. The P-39's designed top speed is about 410 m.p.h. Its original armament included four small-bore machine guns and a 37 mm. cannon firing one pound shells. This also may be undergoing change.

The P-38, in whose prototype Lieut. Ben Kelsey loafed across the continent two years ago at 356 m.p.h. on 60 per cent throttle, is powered by two Allisons and should be good for 420 m.p.h. (Talk of this plane or any other ship in production approaching 500 m.p.h. speeds is, to say the least, slightly exaggerated.) The Lockheed is, of course, larger than any of the others, grossing five as against the others' three tons. Several widely differing armaments have been tried out on the P-38, which went into production only in December. One arrangement: two machine guns, two 20 mm. cannon and one 37 mm. cannon.

One of the most critical problems faced by the Air Corps is the fact that the Allison company still is not able to produce nearly enough of the engines powering all pursuits but the P-47. Production passed the 200-mark in September and is currently about 300. This is enough to equip only 50 to 60 each of the three Allison-powered fighter models. The problem is considered so serious that some are exploring the possibility of substituting another in-line engine—possibly the Rolls Royce *Merlin*, which the Packard company will have in production in about half a year. Because of the Allison's unusual length—93 as against 75 inches for the *Merlin*, for example, this is flatly impossible in the P-38 and P-39, and difficult in the P-46.

These planes by no means complete the roll of types which will make up the Army Air Corps as it develops during the next few years. Military aviation is not standing still, particularly in time of war. In time, for example, fighters powered by 2,000 h.p. in-line engines will probably make their appearance. No such plane is under construction in the United States at present because no such engine is available, as in England and Germany. Over there Napier *Sabre*, Rolls Royce *Vulture*, doubled *Jumo 211*, and doubled Daimler-Benz 601-A engines are already powering super-speedy fighters, like the Hawker *Typhoon* and *Tornado* and Focke-Wulf Fw-156, which will soon go into service. Similar equipment will be developed in the United States.

END

This aerial picture shows the great airport-campus of the Lewis School of Aeronautics. On your left you can see the airplane hangars. Class rooms, flight operations offices, dormitories, are in the center. Dining and private student rooms are on the right.

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Propellers

(*Continued from page 57*)

the radius. The ratio of pitch to diameter is the pitch ratio or p/d. For propellers having adjustable blades the pitch is designated by the incidence of the blade at the 42" radius distance or at the ¾ radius distance. The ¾ R distance has been selected for its maximum aerodynamic influence on thrust and power.

The width of the blade is another factor governing the thrust. Very often the ratio of the total blade area and the propeller disk area is used in theoretical investigations. This ratio is designated as the solidity of the propeller. The planform of the blade has a certain influence on the thrust. It depends on the rotative speed of the propeller. For low revolutions, the blade may be made wider towards the tip.

The design of a propeller, however, depends largely on stresses created by bending, torsional and centrifugal forces, and by the eventuality of a flutter. The increase in efficiency can not be very excessive, for there are only a few per cent left to reach the theoretical limits.

Tests on propellers for static thrust have shown many interesting results. Some of them are contradictory to one another, owing to the different speeds used in testing them. Nevertheless they usually cover the basic laws of physics according to which it takes a specific power to move a certain mass of air.

Tests on a two-blade and a four-blade propeller showed a higher thrust for the later, as plotted in Section 4. Using the same engine (equal torque) and varying the number of the blades, the thrust will follow the line plotted in Section 5 if the blade widths are .041 of the propeller diameter.

The function of the diameter on the thrust is shown in a diagram in Section 6. The thrust increases with the 4th power of the diameter. Doubling the diameter increases the thrust 2x2x2x2, or 16 times.

The thrust again is a function of the square of the rotative speed of the propeller. If the revolutions are increased three times, the thrust will increase 3x3, or nine times.

To secure a highly efficient propeller, its tip speed should not go above 1,000 feet per second. At this speed the efficiency of the propeller will drop rapidly. Pressure gradients of a propeller at high speed are plotted in a diagram shown in Section 9. The break in the curve indicates that the critical speed is reached for this blade-thickness ratio.

Tests conducted with various propellers and pitch ratios on the same gas engine showed that for small diameters the wood propeller is satisfactory. The thrust results are plotted in a diagram in Section 10.

Very often the question arises of the advantages of tandem propellers. Static thrust of tandem propellers is slightly higher than obtained by a four-blade propeller of equal solidity. The difference is only a few per cent, as shown in Section 11. The tandem propellers were set apart by 15 per cent of their diameters, with a slightly higher pitch (one degree) for the rear propeller.

Section 12 gives a formula for estimating the static thrust of a propeller. The curve in the diagram shows the values of the constant for various p/d ratios. For ready use to determine the thrust of a propeller with the required power, a nomograph is appended. The use of the nomograph is simple if similar lines are drawn to the one shown with the example. The center section carries lines denoting thrust and power coefficients of various propeller designs. The heavy straight line gives the theoretical limits of the coefficients. The solid line curve has values for two-blade propellers of various pitch-diameter ratios having a maximum blade width of .082 diameter. Curves in dotted lines are plotted from coefficients of metal propellers with a maximum blade width of .076 diameter. Their settings are in degrees at the .75 ratio station.

The example estimated on the nomograph is to find the thrust and required power for a five-foot propeller running at 2,500 r. p. m. and having a 30 in. pitch or a .5 pitch-diameter ratio. To find the answers draw a horizontal line from .5 on the solid line curve to scale No. 6. Then from this point draw a line through 5 on scale No. 7 to intersect reference line No. 8. A line drawn through this point and 2,500 on scale No. 9 will pass on scale No. 10 through 230 lbs., which is the thrust of the propeller. To find the required horsepower draw a vertical line through .5 on the curve to scale No. 5; connect this point with 5 on scale No. 4 to the reference line No. 3. A line drawn from this point through 2,500 on scale No. 2 will pass scale No. 1 at 32 h.p., the required horsepower.

The nomograph may be used in any other combination of factors. It will be easy to estimate the diameter or the pitch of a propeller as long as lines are drawn similar to the lines used in the example.

Above calculations, however, will not cover every design. The thrust differs if the planform is changed, or the propeller is used as a pusher or tractor. It is not the same if it is used with a large diameter fuselage or close to a wing.

It should be mentioned that a high static or any static thrust does not indicate a highly efficient propeller at climbing and flying. It would be missleading to compare static thrust of a propeller with its required power. Tests that for fractional horsepower input, large diameter and low revolutions thrust up to 70 lbs. to a horsepower has been obtained.

END

Flying Club

(*Continued from page 66*)

his proportion of the down payment before the plane is purchased and the balance in monthly assessments. Should a member decide to drop out, his share should be resold to a new member or returned to the club.

Then, the all-important plane. Most lightplanes are ideal for the work—and it

will pay to shop around a bit to decide which is the most satisfactory to the majority of the members. Most lightplanes now are financed just as are automobiles, the minimum down payment usually being one-third with the balance in 12 monthly payments. Consult your insurance man about insurance to cover the ship. Many clubs do not bother with it.

Then, the all-important hourly charges. Operating costs vary with different localities and different airports, with hangar rents usually $5 to $15 a month for light ships, instructors fees average $2 to $3 an hour and overhaul jobs every 400 or 500 hours averaging about $75.

Here is the hourly operating cost fixed by one airplane company for 50 to 65 h.p. planes—and it will pretty well cover any light airplane:

Gasoline, 3½ gals. an hour at 23 cents	.81
Oil	.11
Hangar, 120 hours a month	.10
Maintenance	.20
	$1.22

Depreciation, of course, must be added to this and one of the most accurate measures of depreciation is at the rate of $1 an hour for every $1,000 invested in the plane (although this is quite a liberal depreciation allowance) so that a $1,500 airplane would cost $1.50 an hour for depreciation. Thus at the end of 1,000 hours, the airplane will have been written off—although it still is far from worn out and would bring quite a good price on today's market.

Here is a suggested constitution:

1. The name of this club shall be.....

2. The purpose shall be to encourage interest in aviation, to provide economical rates for its members, and bring to more people the social benefits and pleasures of flying activity.

3. The officers of this organization shall be president, vice president, secretary, director and treasurer and these officers shall comprise the executive board to handle all matters of policy which shall be presented to a majority of the members for final approval.

4. The membership shall be limited to 00 members and new members may be admitted only after two-thirds approval vote by the total membership.

5. 00 equal shares shall be issued amounting to $00.00 each, which shall be purchased singly by all members. All members are required to share equally any monthly or fiscal obligations.

6. Relinquishment of membership can be made by a member only upon resale of his share with all obligations paid, or by transferring it to a new member who has been approved by the club.

7. At the discretion of the executive board in conjunction with the unanimous vote of existing club members, an individual's membership may be discontinued and upon such action, an individual in question shall be required to forfeit his share with no compensation.

8. Any changes to the constitution may be made after approval by the executive board and two-thirds vote of the total number of members.

Here are some suggested by-laws:

1. All flying shall be done in strict observance of existing Civil Aeronautics Board regulations and local field rules.

2. The instructor shall be termed the director and must be a certified commercial pilot.

3. No flights shall be made without permission of the director who will have sole power for ascertaining flight conditions and advisability of flights. The director shall have the power of grounding any members for a period up to 30 days.

4. All flying time must be scheduled in advance with the director to avoid conflict. An appointment book shall be kept at the airport in which members may make reservations for desired periods of time.

5. Members may take the club airplane for week-end trips after approval of the executive board.

6. Each member shall be allowed the use of the plane for periods of more than a half day during week days, after approval of the board.

7. No member shall make cross-country flights beyond a 50-mile limit unless he hold a certificate of private grade or higher.

8. No member shall land with the club aircraft in any but approved landing fields.

9. Maintenance of the aircraft will at all times be under supervision of a licensed mechanic.

10. In event of damage to property owned by the club, these rules shall apply:

a. If accident is caused by violation of C.A.B. or local regulations, the member at fault shall be responsible for total damages.

b. In event of a member having less than 20 hours of solo flying time, damage up to 66⅔ per cent shall be paid by the member. Exact responsibility shall be determined by the director and the executive board.

c. In event of damage caused by failure of equipment, said member shall be automatically required to pay the first $25.

d. In the event of the person at fault not being required to pay the total damages, the balance of repair bill shall be assessed upon other members or taken from the club treasury.

11. Monthly dues are payable on the first of each month.

12. If, at the second semi-monthly rendering of account due, any member is in

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arrears, said member shall be placed on inactive flying list and barred from use of the aircraft until payment is made.

13. Any member contemplating resigning from the club must submit formal notice and said resignation shall not take effect until 30 days after resignation.

14. Any changes of by-laws must be effected by a majority vote of the membership.

Now, go ahead and organize your flying club.

END

They Wanted Wings

(*Continued from page* 38)

Lockheed *Orion*, a high-winged Lockheed *Vega* and a Boeing P-12 to San Antonio which he flew in accordance with the need for various high and low camera angles.

In "I Wanted Wings" the actors have gone farther than in any previous aviation production in doing their own ground and air work. Rather than resort to any subterfuge, Leisen allowed both Milland and Holden to taxi planes to and from take-offs and on ramps. He permitted Holden to spend two hours learning to taxi a BT-14 and, in subsequent filming, Holden wheeled it about like a veteran.

Holden is the one definitely non-flying member of the main cast. He has flown, on occasion, with the writer and enjoys being a passenger, but says, frankly:

"I don't care to learn to fly. I'll go any place any time in a plane, but for sport give me a horse."

Obviously, the actors didn't stunt any planes for the picture. As the writer explained in a previous article on stunt flying in motion pictures—which is gradually becoming a lost art due to process stage work—valuable players are not permitted to take chances. First, serious injury or death would result in the junking of practically all of a $1,500,000 picture in this case. Second, any accident to Air Corps equipment with a civilian at the controls would have serious repercussions. Third, while the actors mentioned above actually do fly, they are not expert enough to attempt any aerobatics, particularly in equipment with which they are not familiar.

The result is that stunt flyers and cameramen carry the load, with flying backgrounds being made. These backgrounds are later projected on ground glass "screens" on sound stages with the supposed air action being photographed in front of the screens. "Rushes," or film printed daily of the work done the day before, reveal that in this particular picture the process work is hard to detect, even for practiced eyes.

One of the most interesting process shots will never be seen. Using an air background photographed at Randolph and later projected on a sound stage, Wayne Morris and Brian Donlevy suddenly stand up in the BT-14 they are "flying," face each other, take out doughnuts and coffee and "dunk." The scene, printed up, very clearly showed that North American had built a ship which would land all by itself and seemed to indicate the fact that any training of flying cadets was really unnecessary. It landed gracefully in front of "A" stage at the field while the actors sipped coffee and munched doughnuts.

Incidentally, the ship used for process filming was genuine, the last to roll off the production line at North American on the present Army contract. It was shunted to Paramount, used and then sent on its way to an Air Corps training field, its movie career short-lived but exciting.

Outstanding scenes, from a technical standpoint, show the interior of a *Flying Fortress* in flight. Part of the scenes were made in and around one of the Boeings at March Field during a four-day stay there and others were made in an exact replica of the interior, constructed completely at Paramount. Much of the final dramatic action of the production is staged in the long fuselage while it roars over Los Angeles and southern California during the simulated "black out," and millions of people will see what the crews do during action for the first time.

Leisen and a sound crew of five went aloft in a *Flying Fortress*, cruised for several hours with portable sound equipment, recording noises from one end of the fuselage to another, including the almost supernatural sound made by the opening and closing of the huge bomb bay doors.

A glance through the script, which tells the story of the three flying cadets—Milland, Holden and Morris—from the time they enter Randolph Field until the crash of the *Flying Fortress* three years later, reveals that certain dramatic liberties are taken. However, from a technical standpoint, the finished film looks almost foolproof and it will be hard for even experts to pick "movie boners." The latter, incidentally, have become more and more of a rarity with the "education" of Hollywood studios by the aviation industry. Great sums are being spent for authenticity.

The production is not the most expensive, but close to it, as far as aviation pictures are concerned. Howard Hughes has been reported as having spent between $3,000,000 and $4,000,000 on "Hell's Angels," much of that being charged off to "re-takes" due to the advent of sound. "Wings" cost around a million, "Men With Wings," in Technicolor ("I Wanted Wings" is in black and white) a reputed $1,250,000, and "Test Pilot" around a million.

The thing which, from a production standpoint, makes "I Wanted Wings" even more spectacular than any picture to date is the cooperation of the War Department. The fullness of this cooperation gives it a setting which could not under any circumstances be duplicated by any motion picture company, a cast of thousands and airplanes which simple couldn't be secured. Added to this, it has the extreme advantage of timeliness. With the nation talking aviation, thinking aviation, producing more and more planes, developing more and more pilots, it is a "natural."

END

Airy Chat

(*Continued from page 4*)

There are hundreds of thousands of persons who know how, or are learning, to fly. There should—and will—be millions. For the first time in the history of aviation flying will be on speaking terms with the average American.

* * *

ONE of the military aviation services has asked our help in locating non-flying scale models of current foreign military aircraft, principally British, German, Italian and French types. Technical experts of this branch of our armed forces want to use the models to make an aircraft identification training film for enlisted men. It is intended to photograph these models from all angles so as to familiarize military men with the appearance of the warplanes. Can any readers help us locate a few authentic, non-flying scale models?

* * *

WHAT'S-IN-THE-WIND: Captain Elliott Roosevelt's commanding officer at Wright Field recently ordered all newspaper men to stay away from the President's son. . . . Naturally, we're proud of the way FLYING Author Robert A. Winston made that recent forced landing in the ocean off Floyd Bennett Field . . . the ship was a Grumman FF-2 landplane —and Winston didn't even wet his feet. . . . The Navy Department will finance the majority of an expansion program for the Edo Aircraft Corporation, practically the only manufacturers of aircraft pontoons in the U. S. . . . Carl Wootten, one of the most popular men in the aviation industry, has quit his job as vice president of Aeronca to go into business for himself. . . . One of our oldest advertisers, the Lincoln Airplane and Flying School of Lincoln, Neb., is celebrating its 21st year in aviation. . . . The Army and Navy are clamping down on junkets in their aircraft by politicians. . . . The Air Corps recently completed tests of the Bell P-39 during which 40,000 rounds of machine gun ammunition and 500 37 mm. cannon shells were fired at targets in Lake Ontario, near the Bell factory.

Because initial American-built bombers in the French air force had neither armor-plating nor rubber fuel tanks, the report is that they lost 80 per cent of the first 100 ships that went into combat. . . . The U. S. Bureau of Standards, trying to develop a duck-proof windshield for airliners, lately has been shooting hard rubber "ducks" at various types of glass in tests . . . to date, they have determined that about the best solution would be to install a retractable metal grille in front of the windshield on the theory that the grille would cut up any bird hitting it and therefore prevent it from flying through the glass and injuring the pilots. . . . One of the largest lightplane engine manufacturers is altering its engine design slightly to accommodate a new controllable hydromatic propeller for lightplanes that already has gotten its A.T.C. and probably will sell for $175 . . . name of the propeller's designer is DeCesare, a former Milwaukeean now in Chicago. . . . United Air Lines has just sold 40 constant speed propeller to Finland. . . . United's radio equipment at Denver failed recently and they had to get a Denver police squad car to stay at the airport all night to kep in touch with the airliners via its short wave radio. . . . Latest version of Lockheed's twin-engined fighter is the P-38D. . . . Pan American Airways recently bought several twin-engined Cessnas for use in Guatemala. . . . The British have raised their maximum age limit for pilots from 28 to 31. . . . The Westland *Whirlwind*, a new British fighter, has four 20 mm. cannon. . . . Single-engined Beechcrafts have been modified and all restrictions have been removed by the CAA. . . . Miss Belle Baruch, daughter of Bernard Baruch, currently is getting around the country in a new Lockheed "12." . . . The way Pan American Airways gets around regulations forbidding the issuance of free passes on its routes to friends, is to have the CAA authorize them to issue "free transportation for certain persons as observers" on whatever flight is involved. . . . Bell is building 120 P-39's for the Army for $4,962,220, a unit cost of $41,-351.83, including spare parts. . . . The Army recently ordered $582,000 worth of collapsible rubber rafts from the Goodyear company. . . . The version of the Curtiss P-40 going to the British is called *Tomahawk*. . . .

* * *

Happy Easter. MAX KARANT.

END

Letters

(*Continued from page 52*)

them equal to planes at least 10 years from now . . . I'd like an expert to look at my idea for streamlining the power turret on two-seater pursuits like the new Brewster . . . Perhaps the bombers' power turrets can be retracted but I think my idea would do just as well with much saving of weight. Other people are bound to have like ideas. Companies building warplanes should be interested in assigning an engineer or two to look over ideas that would pertain to their designs . . . The Government already has a board to examine all inventions . . . but this would bring revolutionary inventions in *aviation* before the eyes of trained personnel of the smartest aviation staffs in the world . . . Say an airplane company found merit in a certain plan submitted. Have them reward the responsible person with some factory training for, in the name of National Defense, we'd gladly forget about patents—providing the improvements would then be available to all American companies desiring to use them . . .

JACK ANDRICH.

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JANUARY ISSUE

★ RADIO NEWS ★

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in your magazine several months ago . . . The paragraph to which I refer said something to the effect that the Douglas company was building this big airplane for the Army and that it was a million-dollar contribution to our plans for building commercial airplanes, or words to that effect. For your information the Government is paying us about $1,000,000 for the airplane and we will lose no less than $2,000,000 and maybe $2,500,000 before the airplane is delivered. What I mean to tell you is the airplane will bring us $1,000,000 and will cost us $3,000,000 or $3,500,000, so obviously any insinuation that we are doing development work at Government expense is unjust and, on the contrary, the "shoe is on the other foot" . . .

A. M. ROCHLEN,
Director of Public Relations,
Douglas Aircraft Company, Inc.
Santa Monica, Cal.

No Maps Needed

Sirs:

. . . Since I may soon have a job that requires a plane, I would like for a dealer to send a man and a plane to come to my home to give me a demonstration of the plane on the job I would use it for, be able to come close to what it would cost to fly a plane every day over a period of several months and to see if I have the ability to become a fair pilot, and much more information I would need.

I would like for you to come as soon as you can come to [this town] and go up the river about five miles where a bridge crosses north and south, go on west about four miles where the second bridge crosses east and west. Three more miles to a bridge crossing north and south, then I live seven miles north and one mile west. Land on the prairie south of the house and taxi up close.

I hope to see you in a few days.

K. R.

● The above letter was received recently by one of the leading lightplane manufacturers from a small town in the middle west. It was relayed to us by an official of that company. At last reports, a company pilot was flying up and down the river, stop watch in hand.—Ed.

END

I. Ae. S.

(*Continued from page 20*)

York sends each of its units an illustrated lecture every month to use as the basis for meetings, but the activities of the smaller groups located all over the country are controlled by locally-elected officers. It is notable that the Institute received full cooperation from every branch of the aviation industry and from other scientific societies and university faculties in their sectional meetings as well as in the headquarters' conclaves.

Most publicized service of the Institute is its yearly awards. The Sylvanus Albert Reed Award is given "for a notable contribution to the aeronautical sciences resulting from experimental or theoretical investigations, the beneficial influence of which on the development of practical aeronautics is apparent." It consists of a certificate and $250.

A similar prize is presented to the young man who "in the opinion of the Award Committee, has made the greatest contribution to the advancement of aeronautics during the year for which the award is presented." This is known as the Lawrence Sperry Award. Both of these are endowed with $10,000.

To the pilot who has made an outstanding contribution to the aeronautical sciences goes the Octave Chanute Award. Edmund T. Allen was given the Chanute scroll last January by Major General H. H. Arnold for his outstanding work as a test pilot.

In January the Institute's Honors Night and Annual Dinner is the big event. To the Institute it represents a sort of New Year's Day, when all the business of the old year is cleaned up and the members resolutely look forward to the next 12 months. On this night the annual awards are presented before as many members as can jam into a hotel ballroom. The retiring president delivers his valedictory and the succeeding executive takes over. The presentation of honorary memberships and fellowships takes place, the year's achievements are reviewed and the guests depart wondering what further progress will be made before the next annual dinner.

The Institute is unique in that it never had a struggle for existence. Born into a world of depression, it had no need for money and the eminence of its members assured it a stellar position in the aeronautical world. The aviation industry, still a lusty young infant, welcomed a society that would tend to keep the principles of the business high. The Institute performs a necessary service in giving academic recognition to feats that otherwise would be rewarded only with money. Its pat on the back is an incentive to young men and old men in the aeronautical field to strive toward that goal, often forgotten in the commercial rush, of scientific perfection.

Consequently, able individuals and organizations have supported the Institute with their full power. The problem has been not to get enough members but to keep the standards of membership so high that the Institute can maintain its dignity and honorary significance.

In consequence of his great energy and unshakable enthusiasm for the advancement of aeronautics, the Major finds himself engaged in many aeronautical activities. He thinks nothing of making a 25,000 mile tour of the country by air, lecturing and showing movies and at the same time of directing the activities of the Institute and of digging for facts on award committees. He is, incidentally, one of the three Americans ever to have been elected honorary fellows of the Royal Aeronautical Society.

Eight years of existence have been productive for the Institute. It has built up an aeronautical library to rank with any in the world and has made an unimpeachable place for itself among the engineering and scientific societies. Its membership includes most of the accomplished aeronautical scientists and engineers in the United States and a good proportion of the students who will be the aviation greats of the future. It has succeeded in

disseminating important technical and scientific advances through its Journal and its meetings.

But to the average citizen interested in aviation and the workers in the field who probably will never rate a membership in the I. Ae. S., it has done something much more important. It has made available the most complete aeronautical library in the country. In the long run, that may be its greatest service.

END

Mlle. Instructor

(*Continued from page 50*)

flying.

"Miss Harrison is one of the most skilled pilots among the younger generation of flyers in this country," the *Air News* reported. "Only a few weeks ago her 'turn' at Baragwanath during a show arranged in honor of the visit of the film stars, Bebe Daniels and Ben Lyon, was one of the highlights of the program. Her inverted flying was one of the most polished features of her exhibition."

Some may think that men might object to flying with a woman and taking orders from her. However, Helen reports, she has little trouble in this direction. She recounted the case of the young bank clerk who refused to fly with her.

"I was instructing a 50-year-old student at that time. When this objector noticed how well my pupil was getting on with his training he changed his mind about women instructors. He decided to let me teach him after all and I gave him all his instruction leading to his private pilot's license," Helen said.

In her mannish flying kit, Helen took time off to powder her nose and rouge her cheeks before posing for her picture. Even in a bulky flying suit she remembers she is a woman and keeps her nails polished though they are almost always covered by heavy flying gloves during working hours.

To date Helen has had no accidents. "I have had three forced landings," she says, "On two occasions I was able to land on an air field and the other time I picked a broad level field. But I haven't broken a thing," she added touching wood, her one superstition. Actually she reports she is not the least superstitious—a quality generally attributed to pilots and more particularly feminine pilots. To prove this contention she exhibited a clipping of an advance notice of a farewell party she gave in South Africa. The party created quite a stir there because it was being held on Friday 13—a day believed to be fraught with bad luck.

"People in aviation are as superstitious as sailors and for an airwoman to fix on Friday the 13th for entertaining is a proof of the iron nerve which has won Miss Harrison an enviable place in her profession," the *Cape Times* of Cape Town reported.

In addition to her many capabilities as an aviatrix, Helen is a level headed business woman as well. While she admits she is in flying for fun, she adds: "I'm flying because I like it, but also because it's the most remunerative occupation of which I can think." Her sex should be no drawback to a woman pilot, she insists. "We could even be fighters if we were thrown into it. Once in an air battle where it would be a case of 'I get you or you get me' no squeamish feminine foibles would be likely to interfere with our battle ability. You know women can be as ruthless as men, perhaps more so," she said smiling.

Even though she denies there is anything in aviation that a man can do that a woman can't she has had to battle with men to convince them of that. "Since men control the business you have to show them that you're better than they are before they will accept you," she says. Although she has flown light, military and transport planes—practically all kinds—in Canada, United States, England and South Africa, she is unable to crash into the lists of transport flyers. Her ambition is to become the first woman pilot with Trans-Canada Air Lines, Canada's transcontinental passenger and mail service. Thus far, she has been unable to realize that ambition. The reason? She's a woman.

"But don't worry, if the war continues and more and more experienced flyers are needed I may do it yet," she adds hopefully.

END

High-Flyin' Hector

(*Continued from page 34*)

the townsfolk got what they call "the flying bug."

The club members now put in from two to 30 hours a week in the air. Flying club secretary Fahlberg estimates that each member invested about $300 to learn to fly. It cost the members about $50 for dual instruction, he figures, and each one has about 50 hours of solo flying at $5 an hour.

Hector's biggest problem now is to improve the airport. Aviators accustomed to large city fields hardly consider the Hector field as an airport at all. But, as Mayor Smith points out, the field could be worse. In fact it was worse until Smith and the flying club went to work, interested the city council in aviation and enlarged the field from 13½ acres to 35.

A couple of months ago the city arranged the purchase of adjoining land and, by next March, the airport will be enlarged to 75 acres. If Federal aid can be obtained the city will level the field, remove several clumps of trees and bushes, build new runways and perhaps construct new hangars and an airport office.

When the flyers refer you to the airport office now they point across the road to the combined gasoline station and grocery store where there is a weather-beaten sign which reads "Airplane Rides." In the store the flying club keeps the airport registration book, which is just about all there is to the airport office. But the club members would like a real office anyway.

"We do need a better place to keep the book," Fahlberg explains laughingly. "One day we find it in the cracker barrel and the next day it's up on the canned

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goods shelf—takes too much of our time hunting around."

The Hector airport now has runways of 1,452 feet, 1,188 feet and 1,023 feet. When the field is enlarged there will be a north-south runway of 2,300 feet, a northwest-southeast runway of 2,050 feet, a southwest-northeast one of 2,600 feet and an east-west one of 2,200 feet.

If Hector can get the necessary funds, anyone in town will tell you, it soon will have an airport worthy of "the most air-minded city in the U. S."

END

Pilot with an Idea

(*Continued from page 68*)

sorts of weather conditions," he says. "I thought I'd better put some of my knowledge into practice." So he went to work for the Department of Commerce, serving for several months on the Accident Board. That emphasized again and again the need for regulation. "And for obeyance of regulation," he adds, emphatically.

In 1934, this master of all aviation trades served as an engineer in connection with the CWA airport program. Then a few months later came the chance to study traffic control at Newark.

"Traffic control is going to be one of the greatest problems of the future," he says, "and the only way we can keep from having accidents is to apply every regulation to ourselves every day, accepting the added ones. Then we'll never get behind actual traffic conditions and we won't have to have disaster to waken us to our needs."

Today Steele keeps his hand in by flying ships at the various airports he visits in line of business. He's always in demand, not to supply *Aid To Pilots* entirely, but to pass an opinion on this or that problem which confounds some neophyte with a new airplane and no background of experience. He makes his home in Los Angeles and his office is at 2227 West Washington St. He points to a worn automobile.

"Say," he says, "can you imagine me piloting *that?*"

END

Let's Protect . . .

(*Continued from page 64*)

We've more than 75,000 Regulars, Guardsmen and Reservists rapidly reaching action-readiness plus the units to be formed by nationwide conscription. Businessmen have formed a "Plattsburg" camp. Rifle ranges, from police to Army types, are working overtime. The National Guard's veteran 115th Observation Squadron soon will have a $75,000 base at Los Angeles.

Arming to defend an area as vast, as rich, as coveted and as vitally important as Southern California is work for supermen. *But it is beginning at the 11th hour and at a rate which leaves room for hope for the future.*

As we finish writing this article, the long-awaited news already has begun breaking. Up in Alaska, where the weather's the coldest, things seem hottest.

This paradox concerns the $45,000,000-odd which America is pouring into northland defenses. Barring demolition of the Fleet and capture of Pearl Harbor in Hawaii, the Far North appears the best bet for foreign invasion. You could launch an attack pretty effectively on the Pacific Northwest—*and* the Southwest—through the skies from Alaska.

At Big Diomede Island the U.S.S.R. was discovered to have strengthened its own radio and aerial facilities. This is less than two miles from the U. S.

So General Arnold, in his own Air Corps transport, sped to Alaska recently to inspect new army bases at Fairbanks and Anchorage. For the first time in decades a fairly impressive (for *that* area) contingent of troops was ferried north.

Meanwhile the Navy is fortifying the famed "inland passage" down the coast from Sitka. We learn, also, that Los Angeles' own Fort MacArthur has begun to receive antiaircraft guns. One officer remarked significantly that "we're a hell of a lot better off today than we were 90 days ago." That's encouraging.

END

Night Bombardment . . .

(*Continued from page* 46)

Night observation, without flare bombs such as this country has, has been ineffectual against blacked-out communities.

Teachings of the European war, therefore, have been analyzed searchingly by U. S. experts. Ability to see photographically at night—and then to strike swiftly and tellingly—could alter the entire trend of a war. Although R.A.F. men repeatedly have bombed Berlin and other German objectives; although *Luftwaffe* airmen have peppered London, observers note that the lack of exact knowledge of enemy positions and supply centers has been a shackle on victory-making blows. Incidentally, certain phases of this new photographic system recently were released to the British by the War Department.

This is a lesson of utmost importance to our nation. Widespread adoption of the flare bomb will mean that this country will be armed with a virtual superweapon. It means our air forces will be capable of extremely good reconnaissance at night under conditions when ordinary observations might be futile.

It means that, in conjunction with infra-red photography and the world's best bomb sights, America's air forces—at least qualitatively—will be another notch ahead of the rest of the globe.

END

Big Base

(*Continued from page* 70)

Heretofore Pennsylvania-Central has operated flights over Lake Michigan only during the day but, according to Major Pianecki, they will add a night flight between Milwaukee and Detroit shortly, which will bring the total daily flights to nine round-trips for Milwaukee. The major says a new company has come into the picture with a proposal to start a feeder service between Milwaukee and the northern cities of Wisconsin, and Northwest has a bid in with the Civil Air Board for a route from Chicago to New York, which will also stop at Milwaukee.

In fact, the prospects for Milwaukee's aviation future look so good that the field was designed in such a way that runways can be built parallel with the existing ones to permit landings and take-offs in the same direction simultaneously.

That is called forward looking, and the term might be applied to the whole population of Milwaukee County. For they have kept pace with the expansion of aviation without losing their heads in airport building competition with other cities.

END

AOPA News

(*Continued from page* 52)

dents in some places dropped out in large groups fearing that they were being trained for war duty. The original intent of the CPTP program was to promote private flying. The program then became geared to the "national defense" program. The so-called war clause was a part of this change.

Regarding the second factor, AOPA has long advocated the extention of the numbers of students in the non-college group. Yet we know that the military is very desirous of upholding their educational requirements. This may prove to be correct or the opposite may be so, but in the meantime the fixed-base operators are in the doldrums.

Official photograph U. S. Army Air Corps

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FLYING and POPULAR AVIATION USED PLANE LISTING OF AUTHORIZED AIRCRAFT DEALERS

The world's largest selection of used aircraft is listed in this special reader service section. Fine used airplanes in good licensed condition, some with hardly any time at all, many with but a few hours since overhaul. Each plane selected by an expert who has the mark of factory approval due to the fact he is an AUTHORIZED AIRCRAFT DEALER. These are ships you can buy to fly. Select any one of them, they are all real buys, and can be purchased just as you purchase your car.

ALL AIRCRAFT LISTED ARE LICENSED

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
AERONCA					
East Coast Arwys., W. Hanover, Mass.	Chief	Cont. 65	290 hr.	new	$1700
Leeward Aircraft, New Kensington, Pa	Chief	Cont. 65	65 hr.		1650
Mt. Sts. Avia., 3800 Dahlia St., Denver, Col.	Chief	Cont. 65	260 hr.	60 hr.	1600
S. P. Hale, Jr., 309 F St., Ardmore, Okla	Chief	Cont. 65	200 hr.	10 hr.	1600
Bailey Flyg. Service, Kirksville, Mo.	Chief	Lyc. 65	80 hr.		1600
J. O. Dockery, Stuttgart, Ark.	Chief	Lyc. 65	147 hr.		1600
Mt. Sts. Avia., 3800 Dahlia St., Denver, Col.	Chief	Cont. 65	510 hr.	22 hr.	1550
Mt. Sts. Avia., 3800 Dahlia St., Denver, Col.	Chief	Cont. 65	700 hr.	70 hr.	1500
Mt. Sts. Avia., 3800 Dahlia St., Denver, Col.	Chief	Cont. 65	900 hr.	56 hr.	1500
Jacksonville Air Serv., Jacksonville, Fla	Chief	Cont. 65	275 hr.	35 hr.	1500
East Coast Arwys., W. Hanover, Mass.	Tandem	Frnklin. 60	165 hr.	new	1500
Cincinnati Aircraft Ser., Cincinnati, O.		Lyc.	160 hr.		1500
G. E. Verhostra, 2010 Hollywood Place, So. Bend, Ind.	Chief	Dual Lyc.65	170 hr.	new dem.	1450
Harmon J. Johnson, RD No. 4, Binghamton, N. Y.	Chief	Lyc. 65	300 hr.	200 hr.	1450
D. Rohn, 1300 Monroe, Beardstown, Ill.	Chief '40		300 hr.		1485
W. Arnet Speer, 3330 Barnet Ave., San Diego, Cal.	Tandem Tr.	Frnklin. 60	162 hr.	new	1450
E. Porter, Chagrin Arpt., Willoughby, O.	Chief	Cont. 45	350 hr.		1450
Florida Aero & Supply, Orlando, Fla.		Cont. 65	373 hr.	60 hr.	1450
Bailey Flyg. Service, Kirksville, Mo.	Chief	Lyc. 65	250 hr.		1450
C. W. Peterson, Peterson Flyg. Serv., Salem, Mass.	Chief	Cont. 65	270 hr.		1400
Leeward Aircraft, New Kensington, Pa	Trainer	Lyc. 65	15 hr.		1395
Buck Frame, Lovell Fd., Chattanooga, Tenn.	Tandems	Lyc. 65	100 hr.	new	1350
Cincinnati Aircraft Serv., Cincinnati, O.		Lyc.	455 hr.		1350
Hass-Hillyard Flyg. Serv., Municipal Arpt., Evansville, Ind.		Lyc. 65	500 hr.	100 hr.	1350
Huron Flyg. Serv., Box 415, Huron, S. D.	C-65	Cont. 65	700 hr.	5/15/40	1300
Frantz Flyg. Serv., Box 2504, Roanoke, Va.	39	Cont. 65	1050 hr.	500 hr.	1300
G&R Air Serv., Alexandria, Va.	65-C	Cont. 65	289 hr.	yes	1300
C. W. Peterson, Mun. Arpt., Salina, Kansas.	Chief	Cont. 65	295 hr.	none	1295
Jos. R. Higgins, Mozart Pk., Wheeling, W.Va.	Low Wing	Warner 90	800 hr.	90 hr.	1295
Portland Flyg. Serv., Portland, Me.	Chief	Lyc. 55	410 hr.	360 hr.	1295
Warsaw Air Service, Warsaw, Ind.	1939	Lyc. 50	560 hr.	400 hr.	1295
A. R. Smith, Mun. Arpt., Aberdeen, Miss.	Chief	Cont. 50	365 hr.	Nov. 5	1275
Frontier Flyg. Serv., Int'l Falls, Minn.		LeBlond 90	258 hr.	17 hr.	1275
Consol. School Aviation, E. St. Louis, Ill.		Cont. 50	270 hr.		1275
Tred Avon Fly. Serv., Easton, Md.	Chief	Lyc. 55	509 hr.	none	1250
J. A. Atherton, Arpt., Rochester, N. Y.	Trainer	Lyc. 65	120 hr.	No	1250
Tred Avon Fly. Serv., Easton, Md.	Trainer	Lyc. 55	37 hr.	none	1250
J. A. Atherton, Arpt., Rochester, N. Y.	Chief	Cont. 50	240 hr.	No	1250
Un. Aer. Corp., P.O. Box 222, San Antonio, Texas	Chief 1939	Cont. 65	875 hr.	825 hr.	1250
Aeronca Sales, Munic. Arpt., Ft. Worth, Texas	Chief	Cont. 50	425 hr.	50 hr.	1250
Aeronca Sales, Munic. Arpt., Ft. Worth, Texas	Chief	Cont. 50	457 hr.	200 hr.	1250
Chic. Avia. Corp., Palwaukee Arpt., Mt. Prospect, Ill.	65-LA	Lyc. 65	700 hr.	None since	1245
Leeward Aircraft, New Kensington, Pa	Chief	Cont. 50	135 hr.	5 hr.	1245
G. E. Verhostra, 2010 Hollywood Pl., So. Bend, Ind.	Trainer	Lyc. 65	20 hr.	new dem.	1225
Whicker Fly. Serv., Mun. Arpt., Ft. Wayne, Ind.	T.	Franklin 60	150 hr.		1200
G. E. Verhostra, 2010 Hollywood Pl., So. Bend, Ind.	Trainer	Lyc. 65	40 hr.	new dem.	1200
United Aero Corp., P.O. Box 222, San Antonio, Tex.	Chief	Cont. 65	780 hr.	700 hr.	1200
Aeronca Sales, Mun. Arpt., Ft. Worth, Texas.	Chief	Cont. 50	185 hr.		1200
Lenhart Flyg. Ser., Munic. Arpt., Marion, Ind.	Trainer	Frank. 60	90 hr.		1195
Lenhart Flyg. Ser., Munic. Arpt., Marion, Ind.	Chief	Lyc. 65	350 hr.	10 hr.	1195
A. R. Currey, 452 Jefferson, Galesburg, Ill.	Chief	Cont. 50	400 hr.	none	1195
Boulevard Arpt., Inc., Roosevelt Blvd. & Red Lion Rd., Phila., Pa.	Chief (2)	Lyc. 55	600 hr.	200 hr.	1185
Baker-Eberle Aviation Co., Ct. Arpt., Detroit, Mich.	Chief	Franklin 50	250 hr.	never	1175
H. S. Smith, 422 S. Union St., Warsaw, Ind.	KC	Lyc. 50	567 hr.	topped	1175
Hass-Hillyard Fly. Serv.,Mun.Arpt., Evansville, Ind.	LA-65	Lyc. 65	800 hr.	400 hr.	1150
Northern Air Service, Grand Rapids Arpt., Grand Rapids, Mich.	LA.	Lyc. 50	900 hr.	yes	1150
United Aero Corp., P.O. Box 222, San Antonio, Texas		Franklin 50	885 hr.	690 hr.	1125
S.E. Kansas Aircraft Serv., Chanute, Kan.		Frank. 50	746 hr.	327 hr.	1100
Allied Aircraft Sales, Davenport, Ia.		Lyc. 55 ,	746 hr.	327 hr.	1100
Tred Avon Fly. Serv., Easton, Md.	Trainer	Lyc. 55	189 hr.	none	1100
Leeward Aircraft, New Kensington, Pa.	Trainer	Franklin 60	35 hr.		1095
C. W. Peterson, Peterson Fly. Serv., Salem, Mass.		LeBlond 90	420 hr.	none	1075
Queen City Flyg. Serv., Cincinnati, Ohio.		Cont. 50	663 hr.		1050
Jenkins Air Serv., Rochester Arpt., Rochester, N. Y.	Trainer	Franklin 60	375 hr.		1050
United Aero Corp., P.O. Box 222, San Antonio, Texas	Chief	Franklin 50	1350 hr.	1300 hr.	1050
Rome Boekenhoff Jr., 2038 Spring, Quincy, Ill.	Trainer 60 h.p.	Frank. 60	240 hr.		1050
Inter City Airlines, Boston Mun. Arpt., E. Boston, Mass.	Chief	Menasco 50	300 hr.		1050
Blvd. Airport, Roosevelt Blvd. & Red Lion Rd., Philadelphia, Pa.	Chief	Lyc. 50	600 hr.	no	1035
Baker-Eberle Avia. Co., Cty. Arpt., Detroit, Mich.	Chief	Cont. 50	400 hr.	not yet	1025
Cincinnati Aircraft, Cincinnati, Ohio.		Frank.	563 hr.		1025
Edwards Fly. Serv., Flushing Arpt., Flushing, L. I., N. Y.	Chief	Cont. 50	650 hr.		1000
United Aero Corp., P.O. Box 222, San Antonio, Texas.	Trainer	Franklin 60	525 hr.	520 hr.	1000
United Aero Corp., P.O. Box 222, San Antonio, Texas.	Chief	Franklin 50	1100 hr.	1075 hr.	1000
Baker-Eberle Avia. Co., City Arpt., Detroit, Mich.	Chief "38"	Cont. 50	500 hr.	Just recent	1000
Baker-Eberle Avia. Co., City Arpt., Detroit, Mich.	Chief "38"	Cont. 50	1200 hr.	Just	1000
Chas. Roberts, Mun. Arpt., Dothan, Ala.		Cont. 50	375 hr.		1000
O. E. Dickerhoof, Mun. Arpt., Chanute, Kan.		Frank.	457 hr.	400 hr.	1000
Virginia Air Serv., Gordonsville, Va.	Chief	Lyc. 50	700 hr.	May '40	985
C. W. Peterson, Mun. Arpt., Salina, Kansas.	LW	LeBlond 90	418 hr.	90 hr.	975
Ellis Eugene Eno, Eno Arpt., Fort Dodge, Iowa.	Chief	Cont. 50	425 hr.		975
Tred Avon Fly. Serv., Easton, Md.	Trainer	Lyc. 55	452 hr.	342 hr.	975
Sky Sport, Inc., Cincinnati Arpt., Sharonville, Ohio.	Chief	Franklin 50	700 hr.	550 hr.	975
Huron Fly. Service, Box 415, Huron, S. C.	KCA	Cont. 50	660 hr.	Oct. '40	950
Southern Airways Sales Co., Munic. Arpt., Birmingham, Ala.		Cont. 50	175 hr.	9/1/40	950
United Aero Corp., P.O. Box 222, San Antonio, Texas.	Chief	Franklin 50	1450 hr.	1300 hr.	925
Aeronca Sales, Mun. Arpt., Ft. Worth, Tex.	KCA	Cont. 50	200 hr.		900
Portland Flyg. Serv., Portland, Me.		Menas. 50	425 hr.	none	875
Florida Aero & Supply, Orlando, Fla.		Aero. 40	82 hr.		795
Geo. T. Webb, Oneida, Tenn.	K		300 hr.	recent	750
Buroker-Hicks Flyg. Serv., Olympia, Wash.	K	Aero. 40	400 hr.		700
Mississippi Arwys., Jackson, Miss.		Aeronca	406 hr.	Nov. '39	675
Youngstown Arwys., Youngstown, Ohio	K	Aero. 37	300 hr.		675
Lane Air Serv., Mun. Arpt., Albany, Ga.	K	Aero. 42	450 hr.	50 hr.	675
Jenkins Air Serv., Rochester, N.Y.		Aero. 40	400 hr.		650
Oakland Aircraft Corp., Alameda, Cal.	K	Aero. 40	730 hr.	Oct. '39	650
Aero-Way's, Inc., Mun. Arpt., Cleveland, O.	K	45 h.p.	328 hr.	298 hr.	600
Morgantown, W. Va.	K	Aeronca 45	420 hr.	60 hr.	600
Pioneer Air Serv., Romulus, Mich.	K	Aero. 40	482 hr.	9 hr.	600
Daitz Flyg. Corp., Roosevelt, Mineola, L.I.	K	Aero. 37	539 hr	74 hr.	600
Leeward Arcrt. Sales, New Kensington, Pa.	K	Aeronca 40	340 hr.	50 hr.	595
John K. Hinson, Rutherford Arpt., Baltimore, Md.	KC	Cont. A 40	350 hr.	14 hr.	595
Philip A. Meinke, Route 3, Willoughby, Ohio.	C-3	Aero. 36		5 hr. ago	575
East Coast Arwys., W. Hanover, Mass.	K	Aeronca 36	570 hr.	130 hr.	550
Perkiomen Valley Arpt., Collegeville, Pa.	K	Aeronca 40	200 hr.	no	550
Schuylkill Arpt., Orweigsburg, Pa.	C 3	Aeronca 36	393 hr.	July '40	550
Morley Airplane Co., Madison, Wisc.		Aeronca	250 hr.		550
Oscar L. Hostetter, York Arpt., Thomasville, Pa.	K	Aeronca 40	750 hr.	100 hr.	525
A. R. Currey, 452 Jefferson, Galesburg, Ill.	C-3	Aeron. 37	1000 hr.	recently	525
A. R. Currey, 452 Jefferson, Galesburg, Ill.	C-3	Aeron. 37		just	500
Howard G. Mayes, Box 2104, Huntington, W. Va.		Aeronca 40	515 hr.	recently	485
AMERICAN EAGLE					
Valley Flyg. Serv., Rt. 4, Bx. 132, Visalia, Cal.		Kinner 100	700 hr.	25 hr.	550
Lenhart Fly. Serv., Munic. Arpt., Marion, Ind.		Kinner K5	1090 hr.	just	550
ARROW SPORT					
E. R. Elliott, Elliott Motors, Coeur d'Alene, Idaho		Ford V-8	195 hr.		850
Blvd. Arpt., Inc., Roosevelt Blvd. & Red Lion, Phila., Pa.	Model F	V-8 82 hp.	100 hr.	no	800
Hobley-Maynard Air Serv., New Orleans Arpt., New Orleans, La.	Ford 85		400 hr.	20 hr.	750
Aero-Ways, Inc., Mun. Arpt., Cleveland, Ohio.		Ford	450 hr.		525
Blvd. Arpt., Roosevelt Blvd. & Red Lion Rd., Phila., Pa.	Model F	V-8 82 hp.	500 hr.	90 hr.	500
BEECH					
Harry A. Hammill, Box 992, Austin, Texas	D-17-S	Wasp 450	532 hr.		8500
Harry A. Hammill, Box 992, Austin, Texas	D-17-R	Wright 450	900 hr.	700 hr.	8000

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DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Hass-Hillyard Fly. Serv. Mun. Arpt. Evansville, Ind.	B-17 E	Wright 285	1100 hr.	75 hr.	4000
BEECHCRAFT					
Harry A. Hammill, Box 992, Austin, Texas	F-17-D	Jacobs 330	900 hr.	70 hr.	8500
California Aircraft Corp., P. O. Box 170, Van Nuys, Calif.	E17B	Jacobs 285	500 hr.	just	6600
Colorado Aviation Co., 426 U.S. Nat'l B.B., Denver, Colo.		Jacobs 285	746 hr.	yes	4750
Colo. Avia. Company, 1615 Albrin St., Denver, Colo.		Jacobs 285	700 hr.	just	4550
BELLANCA					
Red Bank Arpt., Inc., Red Bank, N. J.	Crusair	LeBlond 90	280 hr.	never	3000
BIRD					
Edwards Fly. Serv., Flushing Arpt., Flushing, L. I., N. Y.	4 Pl.	Kinner 125		20 hr.	1500
Lenhart Fly. Ser., Mun. Arpt., Marion, Ind.		Kinner B5	610 hr.	600 hr.	1195
BOEING					
J. O. Dockery, Stuttgart, Ark.	Duster	Hornet 600	1296 hr.	1175 hr.	2500
BUHL					
Aero Brokerage Service, Inc., Metro. Arpt., Van Nuys, Calif.	Pup	Szekely 45	624 hr.	48 hr.	575
CESSNA					
Wallace Aircraft Co., Clarcona, Florida		Warner 165	50 hr.	new	7995
Hangar Six, Inc., Stinson Fld., San Antonio, Texas	Airmaster	Warner 165	100 hr.		7000
R. G. Howard, Deposit Bank Bldg., DuBois, Pa.	37	Warner 145	450 hr.	405 hr.	3450
Strickland-Horner Air Serv., Arpt., Alva, Okla.	C34	Warner 145	682 hr.	none	2850
Aero Service Inc., McKinley Arpt., Canton, Ohio	4PCLM	Wright J-6-7	425 hr.	130 hr.	1150
John Ruzuka, Circus City Arpt., Peru, Ind.	A.W.	Warner 125	800 hr.	100 hr.	850
CHALLENGER					
Colo. Avia. Co., 1615 Albrin St., Denver, Colo.	Robin	Chall. 185			650
COMMANDAIRE					
Wm. T. Anderson, P.O. Box 275, Essex Fells, N. J.		Chall. 185	635 hr.	yes	600
Charles Ferris, Hillside, Ill.		Warner 125	410 hr.	170 hr.	525
CULVER CADET					
Lane Avia. Corp., Cleveland Arpt., Cleveland, O.		Cont.	150 hr.	no	2000
Port Columbus Fly. Serv., Columbus, Ohio		Cont. 75	50 hr.	no	2000
Sky Sport Inc., Cincinnati Arpt., Sharonville, Ohio		Cont. 75	100 hr.		2000
CURTISS ROBIN					
Toomey, Gatleff & Webb, Knoxville, Tenn.		Wright 165	575 hr.	170 hr.	1400
Leeward Aircraft, New Kensington, Pa.		Chall. 185	512 hr.	17 hr.	885
Geo. Roper, 27 S. State, Salt Lake City, U.		Challenger	800 hr.	Mar. '40	800
Regan Flyg. Serv., Shawnee, Okla.	J65		300 hr.	50 hr.	795
Ralph L. Burton, Alliance Fly. Serv., Mun. Arpt., Alliance, Ohio		Chall. 180	350 hr.	140 hr.	750
H.L.Peterson, W'mson-J'ns'n Arpt., Duluth, Mn.		Curtiss Chall.	442 hr.	190 hr.	750
Al Leeward, New Kensington, Pa.		Challenger 185	500 hr.	110 hr.	745
A. A. Goldsmith, Nashua, N. H.		Wright J65	700 hr.	150 hr.	700
North West Jersey Air Serv., Clinton, N. J.		Chall. 185	550 hr.		675
Al Gillis Fly. Serv., 125-1st Ave., No. Gt. Falls, Montana		Chall. 185	800 hr.	10 hr.	650
Red Bank Arpt., Inc., Red Bank, N. J.		Chall.	400 hr.		650
Red Bank Arpt., Inc., Red Bank, N. J.		Chall. 185	395 hr.	395 hr.	650
Cape Aircraft, Inc., Falmouth Arpt., Hatchville, Mass.	C-1	Chall. 185			600
R. A. Miller, North Benton, Ohio		Chall. 185	444 hr.	380 hr.	550
Fred Kelm, Zap, No. Dakota		Chall. 185	750 hr.	1939	500
H. W. Haver, Lebanon, N. J.		Chall. 185	550 hr.		475
DART					
Brayton Fly. Sv., Lambert Arpt., Robertson, Mo.		Ken-Royce	250 hr.	200 hr.	2975
California Aircraft Corp., P.O. Box 170, Van Nuys, Calif.	GK	Ken Royce 90	300 hr.		2750
Ashcraft Bros. Flyg. Serv., Lawrence, Kans.		LeBlond	370 hr.	325 hr.	2250
DRIGGS					
Northern Air Serv., Grand Rapids Arpt., Grand Rapids, Mich.	Skylark	Cirrus Hi-Drive 95	425 hr.	yes	900
EAGLEROCK					
Thompson Flyg. Serv., Salt Lake City, Utah		Wright J5	1049 hr.	149 hr.	1000
J. O. Dockery, Stuttgart, Ark.		Hisso 180	800 hr.	70 hr.	550
FAIRCHILD					
Colorado Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo.	24	Ranger 165	400 hr.	yes	6000
Carolina Aircraft Sales, Mun. Arpt., Charlotte, N. C.	24	Warner 145	130 hr.	new	5500
Wallace Aircraft Co., Clarcona, Fla.	24	Warner 145	350 hr.		4500
T. A. Colbertson, Medford, Oregon	246	Warner 145	800 hr.	350 hr.	3500
Aircrft. Unlimited, Inc., Hangar 7, Roosevelt Fld. Mineola, L. I., N. Y.	24 1937	Ranger 165	500 hr.	350 hr.	2995

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
W. Va. Air Serv., Inc., Cty. Arpt., Clarksburg, W. Va.	24	Warner	601 hr.	90 hr.	2750
Inter City Airlines, Inc., Boston Mun. Arpt., E. Boston, Mass.	24	Warner 145	1200 hr.	150 hr.	2500
Schneider Aero Serv., Fresno, Calif.		Warner 145	954 hr.	206 hr.	2150
West Coast Aircraft, Inglewood, Calif.	24	Warner 145	755 hr.	227 hr.	2150
John P. Hall, West Haven Arpt., West Haven, Conn.	24	Warner 145	340 hr.	20 hr.	1800
John P. Hall, West Haven Arpt., West Haven, Conn.	24	Warner 145	370 hr.	25 hr.	1800
Art Whitaker, Portland Arpt., Portland, Ore.	24	Warner 145			1675
Chicago Avia. Corp., Curtiss Arpt., Glenview, Ill.	24	Warner 125	520 hr.	100 hr.	1595
Walz Corp. Central Arpt., Camden, N. J.	22	Cirrus 95	973 hr.	210 hr.	1450
Harrisburg Air Serv., Harrisburg, Pa.		Wright	800 hr.	200 hr.	1100
Harrisburg Air Serv., Penn-Harris Arpt., Harrisburg, Pa.	KR-34	Wright J65-175	1193 hr.	1143 hr.	900
Wm. T. Anderson, P.O. Box 275, Essex Fells, N. J.	24-G8	Cirrus 95	580 hr.	yes	850
Wm. T. Anderson, P.O. Box 275, Essex Fells, N. J.	24-C-8	Cirrus 95	560 hr.	yes	800
Piedmont Aviation, Box 1941, Winston-Salem, N. C.	KR34	Wright 165	685 hr.	75 hr.	795
FLEET					
Lynchburg Air Trans. & Sales Corp., Preston Glenn Arpt., Lynchburg, Va.	#9	125 Kinner B-5		300 hr.	2300
Lynchburg Air Trans. & Sales Corp., Preston Glenn Arpt., Lynchburg, Va.	#7	125 Kinner B-5		200 hr.	1600
H. A. Hammill, Box 992, Austin, Texas		Warner 125	700 hr.	35 hr.	1500
E. W. Wiggins Airways Inc., Providence, R. I.	#7	125 Kinner	1500 hr.	recently	1300
Ong Aircraft Corp., P.O. Box 214, Kansas City, Mo.	"2"	Kinner 100	2250 hr.	2206 hr.	1250
FRANKLIN SPORT					
H. W. Haver, Lebanon, N. J.		Lambert 90 H.P.	600 hr.	May '40	650
FUNK					
Bailey Fly. Ser., Box 346, Corning, N. Y.	Model E	Funk 75	175 hr.	no	1400
GREAT LAKES					
The Hudson Valley Aircraft, 88 Dolson Ave., Middletown, N. Y.		Am. Cirrus Mark III 90 h.p.	320 hr.	Nov. '40	850
P. A. Meinke, Route 3, Willo, Ohio	2TIA	Cirrus 90	950 hr.	100 hr.	650
HAMMOND					
Perkiomen Valley Arpt., Collegeville, Pa.	Model Y	Menasco 150	180 hr.	just	3200
Burlington Airplane Co., Burlington, Ia.	K5	Kinner			650
KINNER					
Fredericksburg Air Serv., Nottingham Fld., Fredericksburg, Va.	Sportwing	Kinner B5 125 h.p.	915 hr.	265 hr.	1350
Schneider Aero. Serv., Fresno, Calif.	Sportwing	Kinner B-5 125 h.p.	1335 hr.	506 hr.	1350
Pac. Dis. Corp., 1321 Flower St., Glen., Calif.	Bird K5	Kinner 100	937 hr.	350 hr.	1000
Pac. Dis. Corp., 1321 Flower St., Glen., Calif.	Sport K5	Kinner 100	1375 hr.	675 hr.	1000
Louisville Fly. Serv., Bowman Fld., Louisville, Ky.	Sportster	Kinner 100	466 hr.	c'p't'ly	995
California Aircraft Corp., P.O. Box 170, Van Nuys, Calif.	K5	Kinner 100	1000 hr.	just	985
KITTY HAWK					
Safair, Inc., Roosevelt Field, Mineola, N. Y.		Siemens Halske	675 hr.		550
LAIRD					
J. O. Dockery, Stuttgart, Ark.		J-5-220	845 hr.	825 hr.	1750
Johannesson Fly. Ser., Stevens. Arpt., Winn., Can.	LC200	Wright J5-220	1250 hr.	50 hr.	950
LINCOLN					
Peoria Aero Sales Co., 342 Knoxville Ave., Peoria, Ill.	AP	Kinner 125	400 hr.	50 hr.	795
LOCKHEED VEGA					
H. A. Hammill, Box 992, Austin, Texas		Wasp		15 hr.	5000
LUSCOMBE					
Falcon Aircraft, L. A. Mun. Arpt., Inglewood, Cal.	Phantom	Warner 145	new		4000
C. Evers, 247 Park Avenue, N.Y.C.	Seaplane	Cont. 65	23 hr.		3200
California Aircraft Corp., Box 170, Van Nuys, Calif.		Warner 90	300 hr.		2985
C. Evers, 247 Park Avenue, N.Y.C.	Seaplane	Cont. 65	80 hr.		2300
C. W. Peterson, Municipal Arpt., Salina, Kans.	8A	Cont. 65	60 hr.	none	2295
H. S. Smith, 422 S. Union St., Warsaw, Ind.	8A	Lyc. 65	45 hr.		2150
R. C. Davis, 328 N. Adams St., Glendale, Cal.	8A	Cont. 65	135 hr.	none	2000
Red Bank Arpt., Inc., Red Bank, N. J.	8A	Cont. 65	435 hr.	never	1900
Aircraft Asso. Munic. Arpt., Long Beach, Cal.		Cont. 65	115 hr.		1900
D. Schall, 33 Claggett Rd., Hyattsville, Md.	8-B	Lyc. 65	35 hr.	new	1895
Massey & Ransom Flyg. Serv., Denver, Colo.		Cont. 65	335 hr.		1875
Jersey Fly. Serv. N. J. Arpt., Oak., N. J.		Cont. 65	75 hr.	none	1800
C. Evers, 247 Park Avenue, N.Y.C.	Landplane	Cont. 65	85 hr.		1800
Midwest Av. Sales, Stinson Arpt., LaGrange, Ill.		Lyc. 65	125 hr.		1800
Walz Corp., Central Arpt., Camden, N. J.		Cont. 65	200 hr.	none	1785
Ia. Airplane Co., Mun. Arpt., Des Moines, Ia.		Cont. 65	350 hr.	350 hr.	1750

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Page Airways, Inc., Rochester, N. Y.		Cont. 65	200 hr.	none	1750
Massey & Ransom Flyg. Serv., Denver, Colo.		Cont. 65	350 hr.	60 hr.	1725
Ia. Airplane Co., Mun. Arpt., Des Moines, Ia.		Cont. 65	400 hr.	400 hr.	1700
Sioux Skyways, Inc., Mun. Arpt., Sioux Falls, S. D.	BB	Lyco. 65	250 hr.		1675
J. L. Wells, 106 W. Main, Avon Park, Fla.	8A	Cont. 65	95 hr.	none	1675
W. F. Luke, Schenectady, N. Y.		Cont. 65	100 hr.		1657
Johannesson Fly. Serv., Stevenson Arpt., Winnipeg, Can.		Cont. 50	500 hr.	June '40	1650
A. E. Padags, 340 Park St., Wis. Rap., Wis.	8A	Cont. 65	455 hr.	55 hr.	1650
Iowa Airplane Co., Des Moines, Iowa	8A	Cont. 65	590 hr.		1650
Massey & Ransom Flyg. Serv., Denver, Colo.		Cont. 65	490 hr.		1650
Consol. Sch. Avia., E. St. Louis, Ill.		Cont. 65	180 hr.		1650
Sioux Skyways, Inc., Mun. Arpt., Sioux Falls, S.D.	8A	Cont. 65	735 hr.		1550
A. E. Padags, 340 Park St., Wis. Rap., Wis.	8B	Lyco. 65	275 hr.	none	1550
Island Crop Dusting Co., Caribou, Maine	8A	Cont. 65	400 hr.	300 hr.	1550
Red Bank Airport., Inc., Red Bank, N. J.	8-A	Cont. 65	895 hr.	325 hr.	1500
Sundorph Aero Corp., Cleveland Arpt., O.		Cont. 50	65 hr.	none	1500
Sharon Air Ser., 347 Vernon Ct., Sharon, Pa.		Cont. 50	250 hr.	just	1450
Walz Corp., Central Arpt., Camden, N. J.		Cont. 50	235 hr.	none	1375
A. E. Padags, 340 Park St., Wis. Rap., Wis.	8	Cont. 55	450 hr.	none	1350
Northern Air Serv., Grand Rapids Arpt., Gr. Rapids, Mich.	8A	Cont. 65	950 hr.	yes	1300
Queen City Flyg. Serv., Cincinnati, Ohio		Cont. 50	469 eng. 402 ship.		1250
MONOCOACH					
Carnahan Flyg. Serv., Arpt., Bloomington, Ill.		Wright	998 hr	165 hr.	995
MONOCOUPE					
Arents Air Serv., Armonk, N. Y.	90A	Lambert 90	400 hr.	225 hr.	1700
Al Gillis Fly. Ser., 125 1st Ave., N. Gr. F., Mass.	90A	Lamb. 90	550 hr.	190 hr.	1700
Robert Belt, Red Oak, Iowa	90-A	Lambert 90	468 hr.	325 hr.	1650
Bennett Air Serv., P.O. Box 247, Hightstown, N.J.	6W	Warner-Scarab 125	1447 hr.	70 hr.	1195
Chi. Avi. Corp., Curtiss Arpt., Glen., Ill.	90	Lamb. 90	490 hr.	70 hr.	1195
Aero Ser., Inc., McKin. Arpt., Canton, Ohio		War-Scar 125	750 hr	80 hr.	1150
Oakland Aircraft, Alameda, Cal.		Lamb. 90	688 hr.	Feb. '39	850
NICHOLAS-BEAZLEY					
Sedalia Fly. Serv., 103 N. Ohio, Sedalia, Mo.	8	Genet	360 hr.	300 hr.	525
Dubuque Airways, Dubuque, Iowa		Genet 80	400 hr.	60 hr.	525
Ralph L. Burton, Alliance Fly. Serv., Mun. Arpt., Alliance, Nebraska	Model 8	Genet 80	585 hr.	none	500
PIPER CUB					
Odessa Flyg. Serv., Odessa, Texas	J-4A	Cont.	110 hr.	none	2150
George C. Haven, Schenectady County Arpt., Schenectady, N. Y.	Cub Cpe.	Cont. 65	20 hr.	no	2000
Rome Baekenhoff, Jr., 2038 Spring St., Quincy, Ill.	J4 Coupe	Cont. 65 h.p.	78 hr.	100 hr.	1950
Stile Motor Co., 260 Main St., Northport, N. Y.	J4A Cub	Cont. 65	80 hr.		1950
J. A. Field, 17 Forman St., Bradford, Pa.	J-3-C	Cont. 65	40 hr.	no	1900
J. A. Field, 17 Forman St., Bradford, Pa.	J4	Cont. 65	15 hr.	no	1900
W. Blood Aircraft Sales, Charleston, W. Va.	J-4	Cont. 65	75 hr.	new	1900
Stiles Motor Co., 260 Main St., North, N. Y.	J4A Coupe	Cont. 65	75 hr.	new	1900
Piedmont Av., Inc., Box 1941, Winston-Salem, N. C.	Coupe '40	Cont. 65	45 hr.	none	1860
Hudson Valley Aircraft, 68 Dolson Avenue, Middletown, N. Y.	J 4 Coupe	Cont. 65	40 hr.	Oct. '40	1800
Sedalia Fly. Serv., 103 N. Ohio, Sedalia. Mo.	Cruiser	Cont. 75	60 hr.		1800
Des Moines Fly. Serv., Mun. Arpt., Des M., Ia.	J4	Cont. 65	120 hr.	none	1775
Hangar Six, Inc., Stinson Fld., San An. Tex.	J-4	Cont. 65	310 hr.		1775
John K. Hinson, Rutherford Arpt., Baltimore, Md.	Coupe '40	Lyc. 65 dual	78 hr.	78 hr.	1768
L-H Air Serv., Hatboro Arpt., Hatboro, Pa.	J4	Cont. 65	214 hr.	none	1750
Strickland-Horner Air Serv., Arpt., Alva, Okla.	Cub J4	Cont. 65	130 hr.	top	1700
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.	Coupe '40	Cont. 65	127 hr.	none	1695
Skellys Fly. Serv., Greenville Arpt., Greenville, Pa.	J4 Coupe	Cont. 65	90 hr.	new	1695
Elliott Fly. Serv., Clinton Cty. Arpt., DeWitt, Ia.	J5	Cont. 75	125 hr.		1675
Al Young, Somerset Pike, Johnstown, Pa.	Cruiser	Cont. 75	113 hr.		1675
Wright Fly. Serv., Scott Arpt., Martins Ferry, O.	Coupe '40	Cont. 65	330 hr.	10	1675
Robert Belt, Red Oak, Iowa	J5A	Cont. 75	75 hr.		1650
Elliott Fly. Serv., Clinton Cty. Arpt., DeWitt, Ia.	Cruiser	Cont. 75	140 hr.	none	1650
Bethany Air Serv., Inc., Bethany, Conn.		Cont.	78 hr.		1650
Hudson Valley Aircraft, Middletown, N. Y.		Cont. 65	28 hr.		1650
J. A. Field, 17 Forman St., Bradford, Pa.	J-3-C-65	Cont. 65 d'l	40 hr.	no	1600
Racine Fly. Serv., Racine Arpt., Racine, Wisc.	Cub '40	Cont. 65	250 hr.	210 hr.	1600
Aero Brokerage Serv., Metro. Arpt., Van Nuys, Calif.	Coupe	Cont. 65	210 hr.		1600
Wenatchee Air Ser., Rt. 4, Wena., Wash.	Coupe	Cont. 65	255 hr.		1600
Woodlawn Balto. Co., Baltimore, Md.	Coupe	Cont. 65	153 hr.		1595
McBoyle Cub Sales, Lake Delton Arpt., Lake Delton, Wis.	Cub	Cont. 75	75 hr.	new	1575
Matt. & Rappa, Roosevelt Fld., Min., N. Y.	Coupe	Cont. 65	285 hr.	7-5-40	1575
Clovis Flyg. Serv., Clovis, N. M.		Cont. 65	100 hr.	none	1575
Aviation Ser., Inc., Arpt., Newport News, Va	J-5	Cont. 75	76 hr.		1575
J. A. Field, 17 Forman St., Bradford, Pa.	J-4 1939	Cont. 65	80 hr.	no	1550
Des Moines Fly. Serv., Mun. Arpt., Des Moines, Iowa	J4 Coupe	Cont. 65	275 hr.	none	1550
LD Fly. Ser., Euclid Ave. Arpt., Willo., Ohio.	Coupe	Cont 65	160 hr.	no	1550
Rocky Mount Fly. Ser., Mun. Airp. R. Mt. N. C.	Coupe J-4	Cont. A 65	130 hr.	none	1550
R. E. Lee, Munic. Arpt., Rocky Mount, N. C.	Coupe J-4	Cont. A 65	120 hr.	no	1550

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Southern Air Serv., Memphis, Tenn.		Cont. 65	100 hr.	new	1550
Air City Fly. Serv., 5500 E. Third St., Dayton, O.	J5 Cruiser	Cont. 75	125 hr.		1545
Art Whitaker, Portland Airport, Portland, Ore.	Coupe	Cont. 65	365 hr.	no	1500
Safair, Inc., Roosevelt Field, Mineola, N. Y.	Coupe	Cont. 65	290 hr.		1500
McBoyle Cub Sales, Lake Delton Arpt., Lake Delton, Wis.	Cub	Cont. 75	150 hr.	new	1500
Stiles Motor Co., 260 Main St., Northport, N.Y.	J4A	Cont. 65	210 hr.		1500
Bethany Air Serv., Bethany, Conn.		Cont.	201 hr.		1500
Seidner Fly. Ser., S.A.M. Arpt., Youngs, Ohio	Coupe	Cont. 65	146 hr.	new	1495
Lexington Fly Serv., Mun. Arpt., Lexington, Ky.	Cruiser	Cont. 75	184 hr.		1475
Hylan Flyg. Serv., Rochester, N. Y.		Cont. 65	450 hr.	25 hr.	1450
Thomas Met. Toledo Mun. Arpt., Toledo, O.	Cruiser J-5	Cont. 75	180 hr.	never	1425
Des Moines Fly. Serv., Mun. Arpt., De M., Iowa	J4	Cont. 65	112 hr.	112 hr.	1400
W. Buel, 102 N. Main, Fremont, Neb.	Coupe	Frank. 60	75 hr.	none	1400
Seidner Fly. Ser., S.A.M. Arpt., Youngs., Ohio	Coupe	Cont. 65	200 hr.	new	1400
Piedmont Aviation, Inc., Box 1941, Winston-Salem, N. C.	Coupe '39	Cont.65 dual	75 hr.	244 hr.	1375
Bennett Air Serv., P.O. Box 247, Higt., N. J.	Coupe J4	Cont. 65	145 hr.	145 hr.	1375
Orangeburg Fly. Serv., Box 250, Orangeb, S.C.	J-3	Lyco. 65	15 hr.	none	1350
Piedmont Avia., Inc., Mun. Arpt., W.-S., N.C.	Coupe	Cont. 65	460 hr.	75 hr.	1350
Bennett Air Serv., P.O. Box 247, Hightstown, N.J	Coupe J4	Cont. 65	163 hr.	just	1350
Robert Belt, Red Oak, Iowa	J 5A cruiser	Cont. 75	450 hr.		1350
John K. Hinson, Rutherford Arpt., Balt., Md.	'39 Coupe	Cont.65 dual	283 hr.	5 hr.	1350
M. F. Warrington, Selbyville, Del.	J3	Cont. A55	25 hr.	20 hr.	1350
Tennessee Aero Corp., Nashville, Tenn.	Coupe	Cont. 50	48 hr.	none	1350
Neil McCray Airport, Jamestown, N. Y.	Coupe '39	Cont. 65	160 hr.		1325
L.A. Musgrove, Box 814, Morgantown, W.Va.	Coupe	Cont. 65	250 hr.		1300
Avia. Serv. Co., P.O. Box 32, Brainard Fld., Hartford, Conn.	J3C-65	Cont. 65	15 hr.	new	1300
J.L.Schroeder, Inc., P.O. Box 8055, Houston, Tex.	Coupe J4	Cont. 65	365 hr.	45 hr.	1300
L-D Fly. Serv., Euclid Ave. Arpt., Will., Ohio.	J3-60	Frank. 60	125 hr.	no	1300
W. Arnet Speer, 3330 Barnett, S. Diego, Calif.		Cont. 50	1740 hr.	366 hr.	1300
Al Young, Somerset Pike, Johnstown, Pa.	Trainer	Lyc. 65	37 hr.		1300
Ted Brixius, Columbia, Mo.	Coupe	Cont. 50	196 hr.	none	1295
J.L.Schroeder, P.O. Box 8055, Houston, Texas.	J-3 1940	Cont. 65	100 hr.	no	1290
McBoyle Cub Sales, Lake Delton Arpt., Lake Delton, Wisc.	J3 Spcl.	Lyc. 65D	60 hr.	new	1275
Baker-Eberle Avia.Co., City Arpt., Detroit, Mich.	Coupe	Cont. 65	330 hr.	just	1250
W.Va. Air Serv., Box 401, Cnty. Arpt., Clarksburg, W.Va.	Trainer	Lyc. 65	170 hr.		1250
J. Ruzicka, Circus City Arpt., Peru, Ind.	J3 New	Frank. 60	80 hr.	none	1250
W. Arnet Speer, 3330 Barnett, S. Diego, Cal.	J3F	Frank. 50	900 hr.	25 hr.	1250
W. Arnet Speer, 3330 Barnett, S. Diego, Cal.	J3F	Frank. 50	832 hr.		1250
Odessa Flyg. Serv., Odessa, Texas.	J-3	Frank. 50	405 hr.	none	1250
Inter-City Fly. Serv., Mun. Arpt., Ft. Wayne, Ind.	Sport	Frank. 65	103 hr.		1225
Burlington Airpl. Co., Burlington, Ia.	J3	Frank. 60	60 hr.	new	1200
Barr Aviation Corp., Detroit, Mich.		Cont. 65	230 hr.	none	1200
Northway Flyg. Serv., Columbus, Ohio.	J-4	Frank. 60	350 hr.	yes	1200
Jerry C. Gendron, 208 W. Aurora St., Ironwood, Mich.	1940	Lyc. 65	75 hr.		1195
Palm Beach Aero Corp., W. Palm Beach, Fla.	Coupe	Cont. 65	122 hr.		1195
J. L. Schroeder, Box 8055, Houston, Tex.	J-3 '40	Lyc. 65	80 hr.	no	1175
Bennett Air Serv., Box 247, Hightstown, N.J.	J4	Cont. 50	150 hr.	just	1175
Al Young, Somerset Pike, Johnstown, Pa.	Trainer	Franklin 60	312 hr.		1175
Bowman Fly. Serv., Arpt., Keene, N. H.	J3L	Lyc. 50	460 hr.		1150
Bethany Air Ser., Bethany Arpt., Beth., Conn.	J4	Cont. 50	242 hr.		1150
Va. Cub Dist., Inc., Box 211, Farmv., Va.	Trainer	Lyco. 65	250 hr.		1150
Sweet Fly. Serv., Visalia Mun. Arpt., Visalia, Calif.	J-3-F-50	Frank. 50	829 hr.	now	1100
Wm. T. Anderson, P.O. Box 275, Essex Fells, N.J.	J-3L	Lyc. 55	190 hr.	topped	1100
G. L. Williams, Syracuse Arpt., Syracuse, N. Y.	J3f-60	Frank. 60	620 hr.	just	1100
Art Whitaker, Portland Arpt., Portland, Ore.	J3	Frank. 50	1100 hr.	no time	1100
Inter City Airlines, Inc., Boston Mun. Arpt., E. Boston, Mass.	Tandem	Lyc. 55	600 hr.	just	1100
Maheus'x Arpt., Inc., Stevens Mill Rd., Auburn, Maine	J-2 Seapl.	Cont. 40	346 hr.	20 hr.	1100
Wm. T. Anderson, P.O. Box 275, Essex Fells, N.J.	J-3-L	Lyc. 55	190 hr.	top	1100
Neil McCray Arpt., Jamestown, N. Y.	J-3	Lyc. 65	300 hr.		1100
Art. Whitaker, Portland Arpt., Portland, Ore.	J3	Frank. 50	1000 hr.	1000 hr.	1100
G. L. Williams, Syracuse Arpt., Syra., N. Y.	J3F-60	Frank. 60	825 hr.	735 hr.	1100
Sedalia Fly. Serv., 103 N. Ohio, Sedalia, Mo.	J3	Frank. 60	365 hr.	350 hr.	1100
Odessa Flyg. Serv., Odessa, Texas.	J-3	Frank. 50	864 hr.	169 hr.	1100
Hood Aircraft Sales Co., Northampton, Mass.	J3	Cont. 50	165 hr.		1100
Aviation Ser., Inc., Arpt., Newport News, Va.	J3	Lyc. 55	114 hr.		1100
Somerset Hills Arpt., Basking Ridge, N. J.	J3L	Lyc. 65	225 hr.	no	1090
Oscar L. Hostetter, York Arpt., Thomasville, Pa.	Coupe	Cont. 65	350 hr.	none	1075
Strickland-Horner Air Serv., Alva, Okla.	J3L	Lyc. 50	520 hr.	just	1075
West Coast Aircraft, Inglewood, Calif.	J-3	Cont. 50	1250 hr.	none	1075
B. F. Hines, Mex.-Tex. Arpt., Hobbs, N. M.		Frank.	350 hr.	50 hr.	1075
Hylan Fly. Serv., Rochester Arpt., Rochester, N. Y.	J-3	Cont. 65	775 hr.	9/3/40	1050
John P. Hall, W. Haven Arpt., W. Haven, Conn.	J-3	Cont. 50	450 hr.	50 hr.	1050
Ralph L. Burton, Alliance Fly. Serv., Munic. Arpt., Alliance, Nebraska	J3-F50	Frank. 50	200 hr.	200 hr.	1050
Al Gillis Fly. Ser., 125 1st Ave. N., G. F., Mont.	J3	Frank. 50	170 hr.	none	1050
Wenatchee Air Ser., Rt. 4, Wena., Wash.	J3	Cont. 50	575 hr.	30 hr.	1050
Jersey Fly. Ser., N. Jersey Arpt., Oakl., N. J.	J3	Frank. 60	300 hr.	75 hr.	1050
L. Berry, Selman Field, Monroe, La.	Sport J3	Cont. 50	600 hr.	none	1050
Strickland-Horner Air Serv., Arpt., Alva., Okla.	J3F	Frank.	300 hr.	top	1050
Martin & Phipps, 619 W. 7th St., Sioux City, Ia.	J3	Lyc. 55	400 hr.	none	1050
Burlington Airpl. Co., Burlington, Ia.	J3	Lyc. 50	400 hr.	new	1050
Carolina Aircraft Sales, Mun. Arpt., Charlotte, N. C.	J4	Cont. 65D	340 hr.	325 hr.	1050
Air City Fly. Serv., 5500 E. Third St., Dayton, O.	J 3	Frank. 50	650 hr.		1045
J. A. Atherton, Arpt., Rochester, Minn.	Coupe	Cont. 65	185 hr.	no	1000
Rannells Air Ser., Arpt., Cumberland, Md.	J3	Frank. 60	500 hr.	no	1000

FLYING and POPULAR AVIATION USED PLANE LISTING OF

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Valley Fly. Serv., Rt. 4, Box 132, Visalia, Cal.	J3F	Frank. 50	1100 hr.	10/40	1000
Hawthorne Fly. Serv., Munic. Arpt., Charleston, S. C.		Frank. 60	300 hr.	none	1000
Pekrul's Fly. Serv., Arpt., Traverse City, Mich.	J3	Frank. 50	890 hr.	200 hr.	1000
Page Airways, Inc., Rochester, N. Y.		Lyc. 50	450 hr.	none	1000
L. Dethloff, Airport, Willoughby, Ohio	J-3	Frank.	572 hr.	none	1000
North-West Jersey Air Serv., Clinton, N. J.	J-3	Lyc. 50	165 hr.		1000
Speed's Flyg. Serv., Jackson Hts., N. Y.	J-3	Cont. 50	650 hr.	30 hr.	1000
Aviation Ser., Arpt., Newport News, Va.	J3	Lyc. 50	449 hr.		1000
Leo Carr, Box 134, Charleston, Mo.	Trainer	Frank. 50	200 hr.	no	1000
Aviation Ser. Arpt., Newport News, Va.	J3	Lyc. 50	761 hr.	157 hr.	1000
L. Berry, Selman Field, Monroe, La.	Trainer J3	Lyc. 50	1100 hr.	none	995
Somerset Hills Arpt., Basking Ridge, N. J.	J3f	Frank. 60	650 hr.	no	990
J. A. Field, 17 Forman St., Bradford, Pa.	J-3-F-50	Frank. 50	465 hr.	yes	975
Ellis Eugene Eno, Eno Arpt., Ft. Dodge, Iowa.	Coupe '39	Cont. 65	450 hr.	50 back	975
Barr Avia. Corp., Detroit City Arpt., Detroit, Mich.	Trainer J3	Frank. 50	490 hr.		975
Lane Avia. Corp., Cleveland Arpt., Cleve., O.	Coupe	Cont. 50	150 hr.	no	975
Consol. School Aviation, E. St. Louis, Ill.		Frank. 50	300 hr.		975
Aviation Ser., Inc., Arpt., Newport News, Va.	J3	Lyc. 50	562 hr.		975
Tennessee Aero Corp., Nashville, Tenn.		Frank. 50	250 hr.		970
Des Moines Fly. Serv., Mun. Arpt., Des M., Ia	J3	Frank. 60	250 hr.	new	950
Safair Inc., Roosevelt Fld., Mineola, N. Y.	Trainer	Frank. 50	750 hr.	20 hr.	950
W.Va. Air Serv., Box 401, County Arpt., Clarksburg, W.Va.	Trainer	Frank. 50	170 hr.		950
Utah Pacific Airways, Inc., Box 1187, Ogden, U.	J3	Lyc.dual 55	1193 hr.	1165 hr.	950
Ben. A. Funk, Grover, Mo., Hy. 50		Frank. 50	550 hr.	250 hr.	950
Ray Wilson, Inc., Park Hill Arpt., Den., Colo.	J3F	Frank. 50			950
Clinton Arpt., Elliott Fly. Serv., DeWitt, Ia.	J3	Frank. 50	550 hr.		950
Airways, Inc., Waterville, Me.		Frank. 50	240 hr.		950
Mississippi Airways, Jackson, Miss.		Cont. 50	615 hr.	May '40	950
Frost Air Serv., W. Haven, Conn.		Cont. 50	290 hr.	none	950
Northway Flyg. Serv., Columbus, Ohio	J-3	Cont. 50	325 hr.		950
Northway Flyg. Serv., Columbus, Ohio	J-3	Frank. 50	380 hr.		950
Hood Aircraft Sales Co., Northampton, Mass.	J3	Cont. 50	370 hr.	70 hr.	950
Schuylkill Arpt., Orweigsburg, Pa.	J4	Cont. 55	200 hr.	Aug. '40	950
Harrisburg Air Ser., Penn.-Harris. Arpt., Harrisburg, Pa.	J3L	Lyco. 55	910 hr.	825 hr.	950
Va. Cub Dist., Inc., Box 211, Farmville, Va.	Trainer	Lyco. 50	400 hr.		950
Rocky Mt. Fly. Ser., Mun. Arpt., Rocky Mt., N. C.	J3	Frank. 55	400 hr.	none	950
L-D Fly. Ser., Euclid Ave. Arpt., Willo., Ohio.	J3-50	Frank. 50	650 hr.	no	950
Des Moines Fly. Serv., Mun. Arpt., Des M., Ia	J3	Frank. 60	375 hr.	none	925
W.Va. Air Serv., Box 401, County Arpt., Clarksburg, W.Va.	J3F	Frank. 50	220 hr.		925
Somerset Hills Arpt., Basking Ridge, N. J.	J3L	Lyc. 55	850 hr.	750 hr.	925
Red Bank Arpt., Inc., Red Bank, N. J.	J3	Cont. 50	985 hr.	35 hr.	900
L-H Air Serv., Hatboro Arpt., Hatboro, Pa.	J3	Lycom. 55	900 hr.	300 hr.	900
Rome Bockinhoff, Jr., 2038 Spring St., Quincy, Ill.	J3 Trainer	Frank. 50	800 hr.		900
Jersey Fly. Serv., No. Jers. Arpt., Oak., N. J.	J3	Frank. 50	600 hr.	none	900
Red Bank Arpt., Inc., Red Bank, N. J.	J3	Cont. 50	895 hr.	10 hr.	900
Ellis E. Eno, Eno Arpt., Ft. Dodge, Iowa.	Trainer J3	Cont. 50	475 hr.	recently	900
Ellis E. Eno, Eno Arpt., Ft. Dodge, Iowa.	J3-L-50	Lyco. 50	950 hr.	recently	900
Staff. Rogers, Box 599, Wewoka, Okla.	J3	Frank. 50	800 hr.	600 hr.	900
Hawthorne Fly. Serv., Munic. Arpt., Charleston, S. C.		Frank. 60	750 hr.	100 hr.	900
Ray Wilson, Inc., Park Hill Arpt., Den., Colo.	J3F	Frank. 50			900
Va. Cub Dis., Inc., Box 211, Farmville, Va.	Trainer	Frank. 50	800 hr.	700 hr.	900
Strickland-Horner Air Serv., Arpt., Alva, Okla.	J3-39	Cont. Dual 50	660 hr.	top	900
Bethany Air Serv., Bethany, Conn.		Lyc.	510 hr.	110 hr.	900
Southern Air Serv., Memphis, Tenn.		Lyc. 50	300 hr.	new	900
J. C. Gendron, Ironwood, Mich.	Sport J3	Frank. 50	325 hr.	50 hr.	895
Louisville Fly. Serv., Bowman Fld., Louisville, Ky.	J3F-60	Frank. 60	545 hr.	none	895
Louisville Fly. Serv., Bowman Fld., Louisville, Ky.	J3-F60	Frank. 60	574 hr.	none	895
Somerset Hills Arpt., Basking Ridge, N. J.	J3L	Lyc. 50	900 hr.	750 hr.	890
Northway Flying Serv., Columbus, Ohio	J-3	Frank. 50	650 hr.		880
W. B. Skelton, Greenv. Arpt., Greenv., Pa.	J3	Lyc. 50	650 hr.	Nov. '40	875
J.C. Gendron, 208 W. Aurora St., Ironw., Mich.	Sport	Frank. 50	530 hr.	525 hr.	875
Ellis E. Eno, Eno Arpt., Ft. Dodge, Iowa.	J3-C50	Cont. 50	500 hr.	recently	875
Skelly's Fly. Serv., Greenville Arpt., Grnv., Pa.	J-3	Lyc. 50	675 hr.	50 hr.	875
Hudson Valley Aircraft, 68 Dolson Ave., Middletown, N. Y.	J3	Franklin 50	400 hr.	Sept.'40	875
L. Berry, Selman Field, Monroe, La.	J3	Frank. 50	800 hr.	75 hr.	875
Sky Sport, Inc., Cincinnati Arpt., Sharonville, O.	J350	Frank. 50	436 hr.	will	850
Paul D. Eyster, Angola, Ind.	J-3	Frank. 50	390 hr.	none	850
Paul D. Eyster, Tri State Arpt., Angola, Ind.	J-3	Frank. 50	410 hr.		850
Hylan Fly. Serv., Rochester Arpt., Roch., N. Y.	J-3	Lyc. 50	1050 hr.	Aug. '40	850
L-H Air Serv., Hatboro Arpt., Hatboro, Pa.	J3	Frank. 50	746 hr.	400 hr.	850
L-H Air Serv., Hatboro Arpt., Hatboro, Pa.	J3	Frank. 50	800 hr.	500 hr.	850
Stafford Rogers, Box 599, Wewoka, Okla.	J3	Frank. 50	1100 hr.	800 hr.	850
Va. Cub Dis. Inc., Box 211, Farmv., Va.	Trainer	Cont. 50	400 hr.	300 hr.	850
T. Metcalf, Toledo Mun. Arpt., Toledo, O.	J3F	Frank. 60	600 hr.	520 hr.	850
Paul Eyster, Tri State Arpt., Angola, Ind.	(3 planes)	Frank. 50	425 hr.	none	850
Chi. Avia. Corp., Palwaukee Arpt., Mt. Pros., Ill.	J3L	Lyco. 50	1000 hr.	200 hr.	850
Ranger Flyg. Serv., Ranger, Texas.	J3F	Frank. 50	775 hr.	July '40	825
Louis A. Musgrave, Box 814, Morgantown, W.Va.	J-3	Lyc. 50	550 hr.	150 hr.	800
Louis A. Musgrove, Box 814, Morg., W.Va.	J3	Lyco. 50	575 hr.	250 hr.	800
Akron Airw., Inc., Arpt., Akron, Ohio.		Lyco. 50	800 hr.	200 hr.	800
Ramnells Air Serv., Arpt., Cumberland, Md.	J3	Frank. 50	600 hr.	no	800
Ranger Flyg. Serv., Ranger, Texas.	J3F	Frank. 50	1000 hr.	Apr. '40	800
Ranger Flyg. Serv., Ranger, Texas.	J3F	Frank. 50	775 hr.	May '40	800
Schuylkill Arpt. Co. Orweigsburg, Pa.	J3F	Frank. 50	700 hr.	Mar. '40	800
Susquehanna Air Serv., Montoursville, Pa.	J-3	Lyc. 55	950 hr.	600 hr.	795
Skelly's Fly. Serv., Greenville Arpt., Greenville, Pa.	J-3	Lyc. 50	800 hr.	25 hr.	795
Seaboard Air Trans., Lumberton Arpt., Lumb., N. C.		Cont. 50	450 hr.	just	795

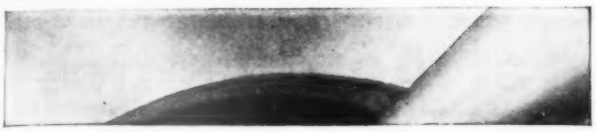
DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Howard G. Mayes, Box 2104, Huntington, W. Va.	J-3	Cont. 50	900 hr.		785
L. H. Melter, Solon Arpt., Solon, Ohio.	J3	Cont. A40	350 hr.	300 hr.	795
Howard G. Mayes, Box 2104, Huntington, W. Va.	J-3	Frank. 50	1000 hr.	50 hr.	785
Bob Howe, Gardner Arpt., Gardner, Mass.	J-3	40 H.P. Cont.	165 hr.	150 hr.	785
T. Metcalf, Toledo Munic. Arpt., Toledo, Ohio	J3F	Frank. 50	1170 hr.	220 hr.	775
Wright Fly. Serv., Scott Arpt., Martins Ferry, O.	J3	Lyc. 50	840 hr.	240 hr.	775
Jenkins Air Serv., Rochester, N. Y.		Cont. 40	450 hr.	25 hr.	775
Martin & Phipps, 619 W. 7th St., Sioux City, Ia.	J2	Cont. A40	400 hr.	recently	765
Bennett Air Serv., P.O. Box 247, Hightstown, N.J.	J-3	Frank. 50	48 hr.	new	750
Sky Sport, Inc., Cincinnati Arpt., Sharonville, O.	J350	Frank. 50	655 hr.	will	750
Akron Airw., Inc., Arpt., Akron, Ohio.		Cont. 50	320 hr.		750
Zimmerly Bros., Lewiston, Idaho.	J-3	Cont. 40	1335 hr.	1242 hr.	750
United Flyers, Inc., Ridgewood, N. J.	J-3	Cont. 40	200 hr.		750
Ranger Flyg. Serv., Ranger, Texas.	J3F	Frank. 50	1100 hr.	Jan. '40	750
H. S. Smith, 422 S. Union St., Warsaw, Ind.	J3	Cont. 40	376 hr.	40 hr.	750
Burlington Airplane Co., Burlington, Ia.	J2	Cont. A40	650 hr.		750
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.	J-3	Cont. 40	364 hr.	346 hr.	700
Ellis Eugene Eno, Eno Arpt., Ft. Dodge, Iowa.	J3-C50	Cont. 50	700 hr.	200 hr.	700
C. R. Galloway, 3006 Hardi, Ft. Smith, Ark.	Sport	Cont. 40	450 hr.	recent	700
L. E. Smith, Sterling, Colo.	J3 Sport	Cont. 40	325 hr.	just	700
Edwards Fly. Serv., Inc., Flushing Arpt., Flushing, L. I., N. Y.	J-3	Cont. 40	1000 hr.		695
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.	J-3	Cont. 40	475 hr.		695
Woodlawn Balto Co., Baltimore, Md.	J-3	Cont. 40	376 hr.	120 hr.	695
Hood Aircraft Sales Co., Northampton, Mass.	J2	Cont. 40	400 hr.	19 hr.	695
Hood Aircraft Sales Co., Northampton, Mass.	J2	Cont. 40	600 hr.		695
Ellis Eno, Eno Fly. Serv., Fort Dodge, Iowa.	Trainer	Cont. 50	675 hr.	200 bk.	675
Allstate Airways, Newton Rd., Haverhill, Mass.		Cont. A40	600 hr.	100 hr.	675
Calkins Arcft., 1022 N. Atlantic, Seattle Wash.		Cont. 40	800 hr.	17 hr.	675
Oakland Arcft, Alameda, Cal.	J-2	Cont. 40	1785 hr.	May '40	665
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.	J-2	Cont. 40	543 hr.	525 hr.	650
Utah Pacific Airwys., Inc., Box 1187, Ogden, U.	J3	Cont. 40	1500 hr.	now	650
J. L. Schroeder, Inc., Box 8055, Houston, Tex.	J-2	Cont. 40	775 hr.	12 hr.	650
Blvd. Arpt., Inc., Roosevelt Blvd., Phil., Pa.	J2	Cont. 40	250 hr.	no	650
Southern Airways Co., Munic. Arpt., Birmingham, Ala.		Cont. 40	250 hr.	7/40	650
Allied Arcft., Davenport, Ia.	..	Cont. 40	385 hr.	100 hr.	650
Bayside Flyg. Serv., Hingham, Mass.	J-3	Cont. 40	800 hr.	110 hr.	650
Calkins Arcft., 1022 N. Atlantic, Seattle, Wash.		Cont. 40	1467 hr.	138 hr.	650
Jones Flyg. Serv., Columbus, Ohio.	J-3	Cont. 40	700 hr.	400 hr.	650
Seidner Fly. Ser., S.A.M. Arpt., Youngs., Ohio	J3	Cont. 40	600 hr.	80 hr.	625
Frost Air Serv., West Haven, Conn.		Cont. 40	355 hr.	recently	625
Calkins Arcft., 1022 N. Atlantic, Seattle, Wash.	J-2	Cont. 40	854 hr.	263 hr.	625
R. E. Lee, Munic. Arpt., Rocky Mount, N. C.	J2	Cont. A40-4	520 hr.	8/40	600
Clinton Arpt., Elliott Fly. Serv., DeWitt, Ia.	J2	Cont. 40	900 hr.	100 hr.	600
W. E. Jones, Arpt., Marlboro, Mass.	J2	Cont. 40		50 hr.	600
G. E. Moon, Airport, Mishawaka, Ind.	J-2	Cont. 40	150 hr.	none	600
Carolina Aircraft Sales, Munic. Arpt., Charlotte, N. C.	J2	Cont. 40	900 hr.	850 hr.	600
B. F. Dodson, 121 S. Luka St., Pratt, Kan.	J3	Cont. A40A	660 hr.	617 hr.	600
Bayside Flyg. Serv., Hingham, Mass.	J-2	Cont. 40	850 hr.	50 hr.	595
West Coast Aircraft, Inglewood, Calif.	J-2	Cont. 40	250 hr.	250 hr.	595
Stiles Motor Co., 260 Main St., Northport, N.Y.	Trainer	40 Cont.	650 hr.	525 hr.	575
Livingston Airways, Arpt., Waterloo, Ia.	J2	Cont. 40	770 hr.	92 hr.	575
D. Rohn, 1300 Monroe, Beardstown, Ill.		Cont.	550 hr.	50 hr.	575
Phillip A. Meinke, Route No. 3, Willo., Ohio.	J2	Cont. A40	479 hr.	re-cov'd	550
Ramnells Air Serv., Arpt., Cumberland, Md.	J2	Cont. 40	500 hr.	50 hr.	550
Rocky Mt. Fly. Serv., Mun. Arpt., Ry. Mt., N.C.	J2	Cont. A40-4	450 hr.	Sept.'40	550
C. W. Peterson, Pet. Fly. Serv., Salina, Kansas	J2	Cont. 40	588 hr.	558 hr.	550
J. Ruzuika, Circus City Arpt., Peru, Ind.	J2	Cont. 40	400 hr.	10 hr.	550
Southern Airways, Munic. Arpt., Birmingham, Ala.		40	700 hr.	9/1/40	550
Chas. Roberts, Mun. Arpt., Dothan, Ala.		Cont. 40	400 hr.	Mar. '40	550
L. Marshall, 1671 Haddon Av., Camden, N. J.	J2	Cont. 40	1000 hr.	Aug. '40	550
Bishop Fly. Ser. Arpt., Flint, Mich.		Cont. A40	600 hr.	35 hr.	550
Krantz Aeronautical Serv., Port Erie, Erie, Pa.	J-2	Cont. A40	350 hr.	75 hr.	525
Louisville Fly. Serv., Inc., Bowman Fld., Louisville, Ky.	J3	Cont. 40	672 hr.	162 hr.	525
Allstate Airways, Newton Rd., Haverhill, Mass.		Cont. A40	675 hr.	125 hr.	525
Daitz Fly. Corp., Roosevelt Field, Mineola, N. Y.	J2	Cont. 40	600 hr.	24 hr.	525
W. Blood Aircraft Sales, Charleston, W. Va.	J-2	Cont. 40	560 hr.	80 hr.	525
Krantz Aeronautical Serv., Port Erie, Erie, Pa.	J-2	Cont. A40	650 hr.	150 hr.	500
C. Breedlove, 2406-27th St., Lubbock, Tex.	J2	Cont. 40	700 hr.	35 hr.	500
Aviation Service, Hartford, Conn.	E-2	Cont. 40	998 hr.	283 hr.	500
Aviation Service, Hartford, Conn.	E-2	Cont. 40	323 hr.	285 hr.	500
PITCAIRN					
Blvd. Airport, Inc., Roosevelt Blvd., Phil., Pa.	Mailwing PA-7-S	Wright 240	354 hr.	no	1800
PORTERFIELD					
Lenhart Fly. Ser., Munic. Arpt., Marion, 'nd.	Deluxe	Warner 90	240 hr.	just	1495
Speed's Flyg. Serv., Holmes Arpt., Jackson Hts., N. Y.		Cont. 50	105 hr.		1200
Bethany Air Serv., Inc., Amity Rd., Bethany, Conn.		LeBlond	178 hr.		900
Livingston Airways, Arpt., Waterloo, Ia.		LeBlond 70	349 hr.	127 hr.	875
Baker-Eberle Avia. Co., City Arpt., Detroit, Mich.		LeBlond 70	485 hr.	400 hr.	850
W. F. Luke, Schenectady, N. Y.		LeBlond 70	450 hr.	100 hr.	800
Hawthorne Fly. Serv., Munic. Arpt., Charleston, S. C.		LeBlond 70	350 hr.		795

AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
S. P. Hale, Jr., 309 F St., Ardmore, Ohio	Flyabout	LeBlond 70	750 hr.		775
Airways, Inc., Waterville, Me.		Cont. 40	68 hr.	new shp.	595
REARWIN					
Al Gillies Fly. Serv., 125 1st Av., N.G.F., Ma.		Ken-Royce 120	50 hr.	none	4000
Al Young, Somerset Pike, Johnstown, Pa.	Ranger	Cont. 75	none		2295
C. Evers, 247 Park Ave., N.Y.C.		Warner 90	138 hr.	none	2250
Falcon Aircraft, L. A. Mun. Arpt., Inglewood, Cal.	Speedster	Menasco125	150 hr.		2250
Falcon Aircraft, L. A. Mun. Arpt., Inglewood, Cal.	Sportster	LeBlond 90	450 hr.	recently	1700
Cape Aircraft Inc., Falmouth Arpt., Hatch, Mass.	Sportster	LeBlond 90	340 hr.	newly	1350
A. E. Padage, Tri-City Arpt., Wisc. Rapids, Wis.	90	LeBlond	178 hr.	73 hr.	1350
Dawson Air Serv., Box 852, Salina, Kans.	Sportster	LeBlond 90p	l. 600hr. e. 200hr.	18 hr.	1325
Four Lakes Aviation, Madison, Wis.	7000	LeBlond 70	300 hr.		1150
Jennings Bros., No. Grafton, Mass.		LeBlond 70	680 hr.	50 hr.	1075
Utah Pacific Airways, Inc., Box 1187, Ogden, U.		LeBlond 85	1100 hr.	900 hr.	1050
Airways Inc., Waterville, Me.		LeBlond 85	280 hr.	new ship	1000
Cape Aircraft, Inc., Falmouth Arpt., Hatchville, Mass.	8500	LeBlond 85	650 hr.	just	950
P. A. Meinke, Route No. 3, Willo., Ohio	8500	LeBlond 85	900 hr.	being o.	950
Aircraft Assoc., Inc., Munic. Arpt., Long Beach, Cal.	7000	LeBlond 70	1580 hr.	1150 hr.	900
Racine Fly. Serv., Racine Arpt., Racine, Wisc.	7000	LeBlond 70	528 hr.	528 hr.	850
Aircraft Assoc., Inc., Munic. Arpt., Long Beach, Cal.	7000	LeBlond 70	1400 hr.	1350 hr.	850
Neal McCray Arpt., Jamestown, N. Y.	1936	LeBlond 70	850 hr.	700 hr.	695
RYAN					
St. Louis Fly. Ser., Lambert Field, Robert, Mo.	STA	Menasco	708 hr.	recently	3250
Galvin Fly. Ser., Boeing Fld., Seattle, Wash.	B-5	Wright 330	3700 hr.	100 hr.	1350
Mid-Western Aviation Co., St. Joseph, Mo.	B-1	J-5-220	630 hr.	8 hr.	995
J. O. Dockery, Stuttgart, Ark.		J-5	600 hr.	100 hr.	850
O'Neal Aircraft Co., O'Neal Arpt., Vincennes, Ind.	B1	J-5	950 hr.	800 hr.	795
SECURITY					
Aviation Serv. Co., Brainard Fld., Hartford, Conn.	S 1 A	Kinner K-5 100 hp.	1040 hr.	300 hr.	850
SIKORSKY					
E. W. Wiggins Airways, Inc., Providence, R. I.	S-39	Wasp 450	700 hr.	recently	6000
Palm Beach Aero, Marrison Fd., W. Palm Beach, Fla.	S38B	Wasp 450	125 hr.	yes	5995
Gilpin Airlines Arpt., Tucson, Ariz.	S-39CS	Wasp, Jr.375	550 hr.	275 hr.	5600
C. Evers, 247 Park Ave., N.Y.C.	Amphib.	Wasp, Jr. 300			3800
SPARTAN					
Aero Brok. Serv., Metro. Arpt., Van Nuys, Calif.	C3	Wright 175	580 hr.	241 hr.	1000
Spartan School of Aeronautics, Box 2551, Tulsa, Okla.	C-3	Wright J6-7	981 hr.	245 hr.	900
Wichita Falls, Air Trans., Wichita Falls, Tex.		Wright 240	330 hr.	110 hr.	900
Spartan School of Aer., Box 2551, Tulsa, Okla.	C-3	Wright J6-5	1193 hr.	28 hr.	850
H. C. Nelson, 3322 Abner Pl., St. Louis, Mo.		Wright	420 hr.	April '35	845
Spartan Sch. of Aer., Box 2551, Tulsa, Okla.	C-3	Wright J6-7	926 hr.	now	750
Spartan Sch. of Aer., Box 2551, Tulsa, Okla.	C-3	Wright J6-5	1443 hr.	252 hr.	700
SPORTWING					
Oakland Aircraft, Alameda, Calif.		Kinner 125	640 hr.	Jan. '40	2400
STANDARD					
O'Neal Aircraft Co., O'Neal Arpt., Vincennes, Ind.		J-5	700 hr.	650 hr.	1195
H. P. Grim, Jr., R.F.D. No. 4, Staunton, Va.	D 31	Kinner B5 125 hp.		70 hr.	850
Upton & Bowen, West Memphis, Ark.		J69-330	500 hr.	50 hr.	1800
Aircraft Assoc., Inc., Munic. Arpt., Long Beach, Cal.	C3B	Wright J5			850
STINSON					
Hyannis Arpt., Box 592, Hyannis, Mass.	SR9BD	Lyc. 245	350 hr.	no	6000
Chi. Avi. Corp., Curtiss Arpt., Glenview, Ill.	Reliant SR8E	Wright 350	275 hr.	80 hr.	5750
Wright Fly. Serv., Scott Airport, Martins Ferry, Ohio	SR9	Lyc. 245	540 hr.	55 hr.	5600
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.	SR-6	Lyc. 245	867 hr.	678 hr.	4675
Thomas Oakes, 240 Belleville Ave., Bloomfield, N. J.	SR9BD	Lyc. 245	620 hr.	350 hr.	4500
Leech Aircraft, Inc., Roosevelt Fld, Mineola, N.Y.	SR-9D	Wright 285			3900
Franklin Rose Aircraft, Alameda, Cal.	10	Cont. 80	225 hr.		3650
Leech Aircraft, Inc., Roosevelt Fld., Mineola, N.Y.	105	Cont. 80	54 hr.	none	3465
Franklin Rose Aircraft, Alameda, Cal.	10	Cont. 80	50 hr.		3450
Portland Flyg. Serv., Portland, Me.	105	80 hp	110 hr.	none	3250
Aircraft Assoc., Inc., Munic. Arpt., Long Beach, Cal.	SR7B	Lyc. 245	839 hr.		3250
George C. Haven, Schenectady City Arpt., Schenectady, N. Y.	105	Cont. 80 Starter	200 hr.	no	3100
Jenkins Air Serv., Rochester Arpt., Roch., N.Y.	105	Cont. 80	127 hr.		3075
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.	105	Cont. 80	160 hr.	none	3075
Indiana Air Serv. Bendix Fld., So. Bend, Ind.	SR 7C	Lyc. 265	1600 hr.	1500 hr.	3000
J. A. Atherton Arpt., Rochester, Minn.	105	Cont. 80	110 hr.	no	3000
Seaboard Air Transport, Lumberton, N. C.	SR-6	Lyc. 225	298 hr.	190 hr.	3000
Leech Arcft., Inc., Roosevelt Field, Mineola, N.Y.	105	Cont. 80	182 hr.	none	2880
Air Service, Mun. Arpt., Denver, Colo.	105	Cont. 80	240 hr.	40 hr.	2800
Pacific Dis. Corp., 1321 Flower St., Glen., Cal.	105	Cont. 75	10 hr.	no	2750
Edwards Fly. Serv., Flushing Arpt., Flushing, L. I., N. Y.	105	Cont. 80	425 hr.	conv'td	2600
Chi. Avi. Corp., Curtiss Artp., Glenv., Ill.	SR5B	Lyco. 245	1000 hr.	100 hr.	2665
S. P. Hale, Jr., 309 F St., Ardmore, Ohio	105	Cont. 75	160 hr.	just	2650
R. Turner Aero Corp., Indianapolis, Ind.		Cont. 75	165 hr.	none	2600
Sioux Skyw., Inc., Muni. Arpt., Si. Falls, S. D.	105	Cont. 80	210 hr.		2500
Johannesson Fly. Ser., Stevenson Arpt., Win., Can.	SM2A	J6-5-175	1750 hr.	May 39	2500
Moline Fly. Serv., Munic. Arpt., Moline, Illinois	SR5-A	Lyc. 245	790 hr.	751 hr.	2495
Leech Arcft., Inc., Roosevelt Field, Mineola, N.Y.	105	Cont. 75	545 hr.	160 hr.	2450
Genl. Aero. Corp., 1717 Ford Bldg., Detroit, Michigan	105	Cont. 75	96 hr.		2450
Sharon Air Ser., 347 Vernon Ct., Sharon, Pa.		Cont. 75	250 hr.	none	2400
John K. Hinson, Rutherford Arpt., Balti., Md.	SR6	Lyc. 225	1070 hr.	230 hr.	2395
Jenkins Air Serv., Inc., Rochester, N. Y.		Cont. 75	170 hr.		2350
Upton & Bowen, W. Memphis, Ark.	105	Cont. 75	250 hr.	50 hr.	2350
Baker-Eberle Avia. Co., City Arpt., Detroit, Mich.	105	Cont. 75	340 hr.	not kn.	2325
Bishop Fly. Ser., Arpt., Flint, Mich.	105	Cont. 75	140 hr.	no	2300
Chi. Avi. Corp., Curtiss Arpt., Glenvi., N. Y.	105	Cont. A75	400 hr.	20 hr.	2275
A. R. Currey, 452 Jefferson, Galesburg, Ill.	105	Cont. 75	500 hr.		2250
P. J. Sones, Co., Haines City, Fla.	105	Cont. 75	230 hr.	none	2250
Franklin Rose Aircraft, Alameda, Cal.	SR5	Lyc. 260	2500 hr.	July '40	2250
Safair, Inc., Roosevelt Fld., Mineola, N. Y.	SR-6	Lyc. 225	80 hr.		2200
Colo. Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo.	105	Cont. 75	248 hr.	yes	2200
P. J. Sones, Co., Haines City, Fla.	SR-6B	Lyco. 245	590 hr.	190 hr.	2200
Susquehanna Air Serv., Montoursville, Pa.	SR-5	Lyc. 245	920 hr.	650 hr.	2050
N. Okla. Fly. Ser., W. D. Mauk, Box 556, Bl., Okla.	SR5E	Lyco. 225	950 hr.	345 hr.	2000
Dufort School of Aeronautics, Massena Arpt., Massena, N. Y.	SR 5E	Lyc. 225	700 hr.	600 hr.	2000
Walter D. Mauk, Municipal Arpt., Blackwell, Okla.	SR 5E	Lyc. 225	950 hr.	engine	2000
Raymond Aero Serv. Co., Airport, Macon, Ga.		Wasp Jr.	950 hr.	Mar. '38	2000
Genl. Aero. Corp., 1717 Ford Bldg., Detroit, Michigan	105	Cont. 75	635 hr.	162 hr.	1975
Genl. Aero. Corp., 1717 Ford Bldg., Detroit, Michigan	105	Cont. 75	708 hr.	289 hr.	1975
K. S. Barber, Munic. Arpt., Pontiac, Mich.	105	Cont. 75	630 hr.	160 hr.	1950
Hawthorne Fly. Serv., Munic. Arpt., Charleston, S. C.	SR5A	Lyc. 245	850 hr.	just	1900
Morey Airplane Co., Madison, Wisc.		Lyc.	800 hr.	350 hr.	1900
Nashville Fly. Ser., Munic. Arpt., Nashville, Tenn.	SR33	Lyc. 215	1700 hr.	yes	1900
Hume & Smyer, Bx. 551, Arkansas City, Kans.	SR6	Lyc. 245	527 hr.	330 hr.	1875
Aero-Way's, Inc., Mun. Arpt., Cleveland, O.	SR 5	Lyc. 325	409 hr.	350 hr.	1850
J. Frank Wilson, New Kingstown, Pa.	SR-5R	Lyc. 225	650 hr.	450 hr.	1800
Miller Flyg. Serv., North Benton, Ohio.		Lyc. 225	565 hr.	May '39	1800
Matthews & Rap., Roosev. Fld., Mine, N. Y.	Sr.-Jr.	Lyco. 215	550 hr.	Aug. '40	1800
Pacific Dis. Corp., 1321 Flower St., Glen., Cal.	SM60008	3 Lyco. 215	5918 hr.	735 hr.	1750
Page Airways, Inc., Rochester, N. Y.		Lyc.	1500 hr.	250 hr.	1750
Wright Fly. Serv., Scott Arpt., Martins Ferry, O.	1933	Lyc. 215	1100 hr.	245 hr.	1525
Brayton Flyg. Serv., Robertson, Mo.		Lyc.	738 hr.	126 hr.	1450
Moberly Fly. Ser., 605 Concannon St., Mob., Mo.		Lyco. R680	1240 hr.	40 hr.	1375
Akron Airways, Arpt., Akron, Ohio.	SR	Lyc.	850 hr.	350 hr.	1350
Akron Airw., Arpt., Akron, Ohio.		Lyco. 215	1200 hr.	315 hr.	1300
Chi. Avi. Corp., Palwaukee Arpt., Mt. P., Ill.	SR	Lyco. 215	1000 hr.	500 hr.	1295
Canton Aviation Co., Canton, Ohio.		Lyc. 215		yes	1200
Huron Fly. Ser., Box 415, Huron, S. D.	SM8A	Lyco. 215	1900 hr.	8-20-40	1100
Seaboard Air Trans., Lumberton, N. C.	R	Lyco. 215	750 hr.	350 hr.	1100
Springfield Aviation, Arpt., Springfield, Ill.	SM-8A	Lyc. 215	760 hr.	360 hr.	1175
R. F. Turner, Airport, Spartanburg, S. C.	S	Lyc. 680	800 hr.	150 hr.	1150
Fox Valley Fly. Serv., Arpt., Aurora, Ill.	S	Lyc. 215	965 hr.	791 hr.	1050
Livingston Airways, Arpt., Waterloo, Ia.	SM8A	Lyc. 215	934 hr.	180 hr.	1050
Perkiomen Valley Arpt., Collegeville, Pa.	SM8A	Lyc. 215	1175 hr.		1000
Odessa Flyg. Serv., Odessa, Texas.	SM-2AB	Wright 220	1767 hr.	none	1000
Four Lakes Aviation, Madison, Wis.	SM-2AA	Wright 65	485 hr.	85 hr.	1000
C. A. Lewis, 776 S. Maffit St., Decatur, Ill.	SMIF	Wright 330	805 hr.	220 hr.	1000
Maheux's Airport, Inc., Stevens Mill Rd., Auburn, Maine.	SM8A	Lyc. 215			995
Livingston Airways, Arpt., Waterloo, Ia.	R	Lyc. 215	3144 hr.	251 hr.	975
E. Braden, Easton Arpt., Easton, Pa.	SM7A	Wright 330	750 hr.		950
Barr Aviation Corp., Detroit, Michigan.		Lyc. 215	890 hr.	5 hr. eng.	950
Jesse Jones Mun. Arpt., Lancaster, Penna.	SM 8A	Lyc. 225	800 hr.	200 hr.	900
Decatur Aviation, 776 S. Maffit St., Decatur, Ill.	SM1F	Wright 330	825 hr.	250 hr.	895
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.	SM8-A	Lyc. 215	639 hr.	just	850
Paul Eyster, Tri State Arpt., Angola, Indiana.	SM8A	Lyc. 220	1240 hr.	230 hr.	850
Island Crop Dusting Co., Caribou, Maine.	SM1-D	Wright 225	500 hr.	30 hr.	800
Midwest Av. Sales, Stinson Arpt., LaGrange, Ill.	SM8A		2025 hr.	yes	800
Glens Falls Fly. Ser., Arpt., Glens Falls, N. Y.	SM8A	Lyc. 215	775 hr.	175 hr.	800
Leeward Aircraft, New Kensington, Pa.		Lyc. 215	900 hr.	250 hr.	795
Northway Flyg. Serv., Norton Fld., Columbus, O.	SM2AB	Wright 220	1200 hr.	Dec. '39	775
Aero Brokerage Serv., Metro Arpt., Van Nuys, Calif.	SM1	Wright J-5 220 hp	1870 hr.	120 hr.	725
P. A. Meinke, Route #3, Willo., Ohio.	SM-2	War-Sca-125		100 hr.	500
TAYLORCRAFT					
Walter D. Mauk, Mun. Arpt., Blackwell, Okla.		Cont. 65	19 hr.	new	1950
C. H. Kenyon, Grand Mere, Quebec.		Lyc. 55	93 hr.	none	1900

FLYING and POPULAR AVIATION USED PLANE LISTING OF AUTHORIZED AIRCRAFT DEALERS

DEALERS	MODEL AND ENGINE		TIME	OVER-HAULED	PRICE
Little Corp. Patco Fly. Fld., Norristown, Pa.	Deluxe	Cont. 65	35 hr.		1900
Narragan. Avi. Ser., R. I. State Arpt., Hills., R.I.	DeLux	Cont. 65	202 hr.		1895
Springfield Aviation, Arpt., Springfield, Ill.	BC	Cont. 65	140 hr.	none	1895
Fox Valley Fly. Serv., Arpt., Aurora, Ill.	Deluxe	Cont. 65	138 hr.	none	1850
Frantz Fly. Ser., Box 2504, Roanoke, Va.	40	Cont. 65	350 hr.		1800
Narragan. Avi. Ser., R. I. State Arpt., Hills., R.I.	DeLux	Cont. 65	308 hr.		1795
C. Breedlove, 2406-27th St., Lubbock, Texas	BL	Lyc. 65	175 hr.	none	1750
C. R. Galloway, 3006 Hardie, Ft. Smith, Ark.	DeLux	Cont. 65	210 hr.	none	1750
C. Breedlove, 2406-27th St., Lubbock, Texas	BC	Cont. Dual 65	235 hr.	none	1750
Bishop Fly. Ser., Arpt., Flint, Mich.		Lyc. 65	50 hr.	new	1750
United Flyers, Inc., Ridgewood, N. J.	BL deluxe	Lyc. 65	165 hr.		1750
Leavens Bros., Barker Arpt., Toronto, Can.		Cont. 50	614 hr.		1750
Colo. Avia. Co., 1615 Albun St., Denver, Colo.		Cont. 65	less than 300 hr.		1725
C. Breedlove, 2406-27th St., Lubbock, Texas	BL	Lyc. 65	300 hr.	10 hr.	1700
Art Whitaker, Portland Arpt., Portland, Ore.	16-K	Kinner 125	1300 hr.	just	1650
Niederhauser Airways, Marshalltown, Ia.	BL	Lyc. 65	209 hr.	no	1650
Washington Pk. Arpt., Homewood, Ill.		Cont. 65	150 hr.	none	1650
Colo. Avia. Co., 426 U.S. Nat'l B.B., Denver, Colo.		Cont. 65	400 hr.	yes	1600
Clinch Fly. Ser., Muni. Arpt., N. Pl., Neb.	B	Lyco. 65	1000 hr.	800 hr.	1600
L. E. Daniels, Crete, Ill.		Cont. 65	175 hr.	none	1595
Dufort School of Aeronautics, Malone & Massena, Airport, Malone, N. Y.		Lyc. 55	50 hr.		1500
Hubert & Dillon Air Serv., Inc., Box 177-S, Tacoma, Wash.	39	Cont. 65	450 hr.		1500
Charles Feris, Hillside, Ill.		Lyco. 65	225 hr.		1500
Howard Travis, Big Rapids, Mich.	BL65	Lyc.	325 hr.		1500
Rochester Aero Corp., Rochester, N. Y.		Lyc.	250 hr.		1500
Ed. Nibur, Madiera Arpt., Bernharts, Pa.		Cont. 65	385 hr.		1500
Ben. A. Funk, Hy. #50, Grover, Mo.		Lyco. 65	30 hr.	since new	1495
Merrill Hale, Hillsgrove, R. I.		Cont. 65	490 hr.		1495
Fox Valley Fly. Serv., Arpt., Aurora, Ill.	Trainer	Lyc. 65	60 hr.	none	1475
Inter City Airlines, Inc., Boston Mun. Arpt., E. Boston, Mass.	1940	Lyc. 65 hp	80 hr.		1475
W. B. Jones, Arpt., Marlboro, Mass.		Lyc. 65	262 hr.		1475
C. R. Galloway, 3006 Hordie, Ft. Smith, Ark	Delux	Lyco. 65	625 hr.	recent major	1475
Inter City Fly. Serv., Mun. Arpt., Ft. Wayne, Ind.	Deluxe Craft	Cont. 65	550 hr.		1450
Peoria Aero Sales, 342 Knoxville, Peoria, Ill.		Lyc. 65	40 hr.	none	1450
W. B. Jones, Arpt., Marlboro, Mass.		Lyc. 55	210 hr.		1450
Ed. Nibur, Madiera Arpt., Bernharts, Pa.		Lyc. 55	120 hr		1450
Four Lakes Aviation, Madison, Wisc.	BL	Lyc. 65	399 hr.	30 hr.	1450
Aviation Country Club, Cedar Rapids, Ia.	BF	Frank. 50	110 hr.		1450
Inter City Fly. Serv., Mun. Arpt., Ft. Wayne, Ind.		Lyc. 50	177 hr.		1425
Dawson Air Ser., Box 852, Salina, Kans.	Delux	Lyco. 65	600 hr.	40 hr.	1400
Washington Pk. Arpt., Inc., Homewood, Ill.		Lyc. 50	85 hr.	none	1390
Washington Pk. Arpt., Inc., Homewood, Ill.		Lyc. 50	104 hr.	none	1375
R. Koleman, 921 Hayes Ave., Fremont, Ohio.		Cont. 65	504 hr.	none	1375
Walter D. Mauk, Mun. Arpt., Blackwell, Okla.	Blt. 50	Lyc. 50	160 hr.	new Aug.	1350
Neiderhauser Airways, Marshalltown, Ia.	BL	Lyc. 65	450 hr.	no	1350
Hood Aircraft Sales Co., Northampton, Mass.		Cont. 50	200 hr.		1350
Athens Flyg. Serv., Athens, Ga.	BC 38	Cont. 50	418 hr.	385 hr.	1350
L. E. Daniels, Crete, Ill.	BT	Lyc. 50	125 hr.	none	1325
J. E. Badger, 1780 Green Rd., So. Euclid, O.	BC '39	Cont. 65	145 hr.	top 10/5	1300
Aviation Country Club, Cedar Rapids, Ia.	BC	Cont. 50	318 hr.	18 hr.	1300
Washington Pk. Arpt., Inc., Homewood, Ill.		Lyc. 55	235 hr.	none	1295
North. Okla. Fly. Serv., Walter D. Mauk, Box 556, Blackwell, Okla.	BF-50	Frank. 50 dual	250 hr.	none	1275
Valley Fly. Serv., Rt. 4, Box 132, Visalia, Calif.	BLT	Lyc. 55	400 hr.		1275
Dufort School of Aeronautics, Malone Arpt., Malone, N. Y.		Lyc. 55	220 hr.		1250
Peoria Sales, 342 Knoxville, Peoria, Ill.		Lyc. 50	210 hr.	none	1250
Ryan Air Serv., Decorah, Ia.		Lyc. 50	295 hr.		1250
Raymond Aero Serv., Macon, Ga.		Lyc.	685 hr.	Mar. '40	1250
Ryan Air Service, Decorah, Iowa.	BL	Lyc. 50	450 hr.	1375 hr.	1200
O'Neal Aircraft Co., O'Neal Airport, Vincennes, Ind.		Lyc. 55	450 hr.	no	1200
Dawson Air Ser., Box 852, Salina, Kans.	Delux	Lyco. 53	600 hr.	50 hr.	1200
Clinch Fly. Ser., Mun. Arpt., N. Pl., Nebr.	B	Lyco. 50	700 hr.	yes	1200
Balt. School of Aero, Baltimore, Md.		Lyc.	341 hr.		1200
Four Lakes Aviation, Madison, Wisc.	BL	Lyc. 50	490 hr.	none	1200
Gilpin Airlines, Arpt., Tucson, Ariz.	BC	Cont. 50	500 hr.		1200
R. Turner Aero Corp., Indianapolis, Ind.		Frank. 50	247 hr.	top	1200
Greenville Sch. of Avia., Greenville, Ohio.		Lyc. 145	232 hr.	June '40	1200
Dubuque Airways, Dubuque, Ia.	BL	Lyc. 50		none	1200
L. E. Daniels, Crete, Ill.		Lyc. 55	300 hr.	none	1195
J. Frank Wilson, New Kingstown, Pa.	BL	Lyc. 55	250 hr.		1185
Phillips Fly. Serv., Arpt., Mt. Pleasant, Mich.		Lyc. 50 h.p.	700 hr.	100 hr.	1175
John P. Hall, W. Haven Arpt., W. Haven, Conn.	B	Lyc. 50	400 hr.	new m't'r	1175
Phillips Fly. Serv., Arpt., Mt. Pleasant, Mich.		Lyc. 50 h.p.	925 hr.	900 hr.	1150
Fred Helm, Zap, No. Dakota	B.F.	Frank. 50	295 hr.		1150
Hubert & Dillon Air Serv., Box 177-S, Tacoma, Wash.	'39	Lyc. 50 h.p.	1185 hr.	Nov. '40	1150
Bob Howe, Gardner Arpt., Gardner, Mass.		Lyc. 50 h.p.	30 hr.	new	1150
H. C. Phillips, Arpt., Mt. Pleas., Mich.		Lyco. 50	700 hr.	650 hr.	1150
United Flyers, Ridgewood, N. J.	BF	Frank. 50	220 hr.		1150
Hopewell Flyg. Serv., Hopewell, Va.		Frank. 50	275 hr.	none	1150
A. J. Moore, 324 State St., Baden, Pa.		Lyc. 55	435 hr.	40 hr.	1150
Schneider Aero Serv., Fresno, Cal.		Cont. 50	737 hr.	49 hr.	1150
H. C. Phillips, Arpt., Mt. Pleas., Mich.		Lyco. 50	950 hr.	950 hr.	1150
Canton Aviation, Canton, Ohio.		Lyc. 50	291 hr.	yes	1150
Raymond Aero Serv., Macon, Ga.		Cont.	550 hr.	Nov. '39	1150
Aviation Serv. Co., Inc., Brainard Field, Hartford, Conn.		Lyc. 55 h.p. Dual	200 hr.	just t'p'd	1100
Canton Aviation, Canton, Ohio.	BL deluxe	Lyc. 50	300 hr.		1100
Rochester Aero Corp., Rochester, N. Y.		Lyc.	475 hr.	25 hr.	1100
John P. Hall, West Haven Arpt., W. Hav., Conn.	B	Lyc. 50	350 hr.	new m't'r	1075
Narragan. Avi. Ser., R. I. State Arpt., Hill., R.I.		Cont. 50	600 hr.	540 hr.	1075
Oscar L. Hostetter, York Arpt., Thomasville, Pa.	BL-T	Lyc. 50	550 hr.	none	1050
Dubuque Airways, Dubuque, Ia.	BL	Lyc. 50	600 hr.	100 hr.	1050
Merrill Hale, Hillsgrove, R. I.		Frank. 50	268 hr.	35 hr.	1050
Johannesson Fly. Serv., Stevenson Arpt., Winnipeg, Can.	A	Cont. 40-3	1300 hr.	Dec. '39	995
Moberly Fly. Ser., 605 Concannon St., Mob., Mo.		Frank. 50	650 hr.	100 hr.	995
Inter-City Flyg. Serv., Mun. Arpt., Ft. Wayne, Ind.		Frank. 50	625 hr.	500 hr.	980
Port Columbus Flying School, Columbus, O.		Lyc.	1000 hr.	yes	975
Dufort School of Aeronautics, Malone, N. Y.		Frank. 50	650 hr.	550 hr.	950
L. A. Musgrove, Box 814, Morgantown, W. Va.		Trainer-L-55	675 hr.	250 hr.	950
L. A. Musgrove, Morgantown, W. Va.		Lyc. BL-50	600 hr.	250 hr.	950
C. Breedlove, 2406-27th St., Lubbock, Texas	BL Tr.	Lyc. 50	550 hr.	none	950
Dubuque Airways, Dubuque, Ia.	BF	Frank. 50	400 hr.		950
R. D. Lyon, RD No. 1, Warren, Ohio		Lyc. 50	500 hr.	yes	895
Hubert & Dillon Air Serv., Box 177-S, Tacoma, Wash.	'38	Cont. A40-A	1100 hr.	Nov. '40	895
Piedmont Avia., Inc., Box 1941, Winston-Salem, N. C.		Frank. 50	486 hr.	top 392	850
W. F. Luke, Airport, Schenectady, N. Y.		Frank. 50	350 hr.		825
Jesse Jones, Mun. Arpt., Lancaster, Pa.	B C	Cont. 50	300 hr.	none	800
Jesse Jones, Mun. Arpt., Lancaster, Pa.	1939	Cont. 50	400 hr.	50 hr.	800
Dennison Arpt. Oper. Co., Arpt., Quincy, Mass.	A	Cont. 40	1000 hr.		800
Jennings Bros., No. Grafton, Mass.		Cont. 40	660 hr.	100 hr.	800
I. Munroe, Inc., P.O. Bx. 957, Tallahassee, Fla.	A	Cont. 40	225 hr.	25 hr.	800
Aviation Country Club, Cedar Rapids, Ia.	A	Cont. 40	685 hr.	June '40	800
Stinson Flyg. Corp., Glendale, Calif.		Cont. 40	1100 hr.	170 hr.	760
Cape Aircraft, Inc., Falmouth Arpt., Hatchville, Mass.	Mod. A '38	Cont. A-40	900 hr.	140 hr.	750
Ryan Air Service, Decorah, Iowa		Cont. 40	326 hr.		750
Orangeburg Fly. Serv., Inc., Box 250, Orangeburg, S. C.	"A"	Cont. 40	500 hr.	100 hr.	750
Reifenberg Avia., Inc., St. Johns, Pa.	Mod. A '38	Cont. A40-4	275 hr.	25 hr.	750
Valley Fly. Serv., Rt. 4, Box 132, Visalia, Cal.	A	Cont. 40	650 hr.	no	750
Buroker-Hicks Flyg. Serv., Olympia, Wash.	A-2PCLM	Cont. 40	450 hr.	none	750
Athens Flyg. Serv., Athens, Ga.	38	Cont. 40	618 hr.	560 hr.	750
Ryan Air Service, Decorah, Ia.		Cont. 40	326 hr.		750
United Flyers, Inc., Ridgewood, N. J.	A	Cont. 40	250 hr.		750
Sky Harbor, Inc., Indianapolis, Ind.	A	Cont. 40	521 hr.	Aug. '39	750
H. S. Smith, 422 S. Union St., Warsaw, Ind.		Cont. 40	800 hr.	100 hr.	750
Orangeburg Fly. Serv., Box 250, Orangeburg, S.C.	"A"	Cont. 40	500 hr.	100 hr.	725
Sweet Fly. Ser., Visalia Mun. Arpt., Vis., Cal.	A	Cont. 50	839 hr.	100 hr.	725
A. R. Smith, Mun. Arpt., Aberdeen, Miss.		Cont. 40	750 hr.	Oct. 1st	700
Carnahan Flyg. Ser., Bloomington, Ill.		Cont. 40	507 hr.	100 hr.	700
Clinch Fly. Ser., Muni. Arpt., N. Pl., Nebr.	A	Cont. A40	850 hr.	700 hr.	700
Merrill Hale, Hillsgrove, R. I.		Cont. 40	1081 hr.	100 hr.	695
Rome Bockenhoff, Jr., 2038 Spring, Quincy, Ill.	1937	Cont. 40	620 hr.	Oct. '40	650
Utah Pacific Airways, Inc., Box 1187, Ogden, U.		Cont. 40	1200 hr.	1050 hr.	650
Reifenberg Avia., Inc., St. Johns, Pa.	A1938	Cont. A40-4	450 hr.	22 hr.	650
Whicker Fly. Serv., Mun. Arpt., Ft. Wayne, Ind.		Cont. 40	750 hr.	60 hr.	650
Fox Valley Fly. Serv., Arpt., Aurora, Ill.	1937	Cont. A-40	865 hr.	now	650
Sky Sport, Inc., Cincinnati Arpt., Sharonville, O.		Cont. 40	975 hr.	800 hr.	650
R. E. Lee, Munic. Arpt., Rocky Mount, N. C.		Cont. 40	465 hr.	9/40	650
J. L. Wells, 106 W. Main, Avon Park, Fla.		Cont. 40	690 hr.	100 hr.	650
Howard Fly. Ser., Bx. 565, Ames, Iowa.		Cont. A40	875 hr.	75 hr.	650
H. G. Phillips, Arpt., Mt. Pl., Mich.		Cont. 40	700 hr.	600 hr.	650
Bishop Fly. Ser., Arpt., Flint, Mich.		Cont. A40	800 hr.	50 hr.	650
United Flyers, Inc., Ridgewood, N. J.	A	Cont. 40	460 hr.	20 hr.	625
Jersey Fly. Ser., No. Jers. Arpt., Oak. N. J.		Cont. 40	700 hr.	150 hr.	600
Palm Beach Aero Corp., W. Palm Beach, Fla.		Cont. 40	238 hr.		595
Chas. Ferris, Hillside, Ill.	A	Cont. A40	900 hr.	750 hr.	575
Cape Aircraft, Inc., Falmouth Arpt., Hatchville, Mass.	Model A	Cont. A-40	340 hr.	just	550
Joe Cox, Knox, Indiana	Chumney	Kinner 90		yes	550
Habl-May. Air Ser., N. O. Arpt., New Or., La.	A	Cont. 40	1000 hr.	150 hr.	500
TRAVELAIR					
Bayside Flyg. Serv., Hingham, Mass.	6000	Wright 330	1600 hr.	25 hr.	1795
E. W. Wiggins Airways, Norwood, Mass.		S-6000-B	1000 hr.	recently	1600
Bayside Fly. Serv., Muller Arpt., Revere, Mass.	S 6000B	Wright 300	1600 hr.	3/15/39	1595
Lynchburg Air Trans. & Sales, Preston Glenn Arpt., Lynchburg, Va.		Wright J5	800 hr.	now	1450
Aero Brok. Serv., Metro. Arpt., Van Nuys, Calif.	B4000	Wright 175	2613 hr.	86 hr.	1450
Jones Flyg. Serv., Columbus, Ohio.		Wright J-5	500 hr.	May '38	1250
W. Arnet Speer, 3330 Barnett, San Diego, Calif.	B-4000	Wright J5-225	1348 hr.	104 hr.	1250
Sky Harbors, Inc., Indianapolis, Ind.		Wright	600 hr.	80 hr.	1200
J. Frank Wilson, New Kingstown, Pa.	E-4000	Wright 175	750 hr.	60 hr.	1185
Hass-Hill. Fly. Ser., Mun. Arpt., Evans., Ind.	E-4000	Wright 175	1000 hr.	100 hr.	1100
N. Idaho Fly. Serv., Weeks Fld., Coeur D'Alene, Idaho.	4000	Wright J5-220	1100 hr.	1050 hr.	1100
Ashcraft Bros. Fly. Serv., Arpt., Lawrence, Kan.	B-4000	Wright 220		15 hr.	1000
Ray Porter, Chagrin Arpt., Willoughby, O.	C-4000	Chall. 185	650 hr.	just	1000
Odessa Flyg. Serv., Odessa, Texas	4000	Wright 220	506 hr.	489 hr.	1000
Bayside Flyg. Serv., Hingham, Mass.	10-D	Wright 250	700 hr.	40 hr.	950
Aero Serv., McKinley Arpt., Canton, Ohio.	Trainer	Wright Gipsy 96	700 hr.	5 hr.	800
V. S. King, Warren Arpt., Warren, Pa.	2000	Tank 73-115	Ship 725 hr. Motor 430 hr.	40 hr.	525
Northway Flyg. Serv., Columbus, Ohio.		Wright 220	1100 hr.		950
Bayside Fly. Serv., Muller Arpt., Revere, Mass.	10-D	Wright 240	513 hr.	11 10/39	895



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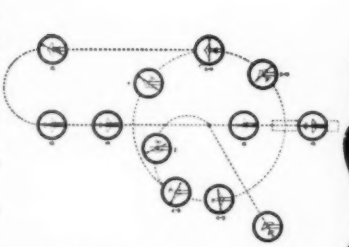

The above drawing illustrates the progressive evolution of an instrument approach and landing maneuver using Learmatic Navigator.

Top right: the Learmatic instrument case. It houses the directional gyro unit, and mounts the gyro course setting and caging controls.

Lower right: the dial face of the Learmatic, showing the linear 360° Azimuth Scale divided into equal degree marks.

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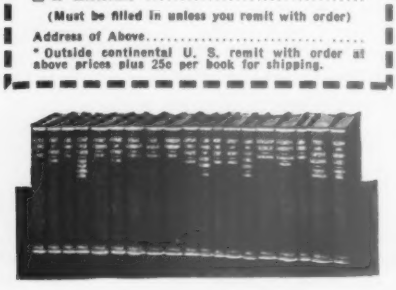

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502 Pages, 198 Illustrations, $4.50

THROUGHOUT, Mr. Eddy has been guided by two considerations: First, the requirements of the Federal Communications Commission as to the aviation radio licenses and the regulations of the Civil Aeronautics Board as to radio in aviation; Second, approved usage of existing equipment for both communication and for purposes such as course guidance and instrument landing. Contains 205 questions to enable reader to test his grasp of book's explanations.

PARTIAL OUTLINE

Aviation Radio Communications: Regulations. How to get an operator's license: Second, Third Class Radiotelephone; Third Class Radiotelegraph Operator, How to learn the code.

Fundamentals of Electricity: Emission of electrons. Units. Ohm's Law. Simple circuits. Conductors, resistors, insulators.

Radio Electricity: Alternating current. Inductance. Coupling. Transformers. Capacity. Reactance. Impedance. Resonance.

Radio Circuits: Oscillatory circuit. Frequency, wavelength, waves. Circuits containing conductance and capacity. Antenna circuits. Coupled circuits. Wavetrap and filter circuits.

Radio Tubes: Structure. Operation. Diodes, triodes. Tetrodes and pentodes. Detectors. Amplifiers.

Batteries: Primary batteries. Dry cells. Care, maintenance. Battery chargers. Edison battery.

Power Supplies: Dynamo-electric machines. Alternators. D.C. generators. Motors. Dynamotors. Motor generators. Rectifiers and filters.

Radiotelegraph Transmitters: Design requirements. Transmission theory. Radio wave characteristics. Oscillator circuits. Piezo-electric crystals. Keying transmitters. TBK transmitter.

Radio Range Beacons: Principles of operation. TMH transmitter. SMRA beacon. "Fan" type, CHF, Z type markers.

Radiotelephone Transmitters: Electrical principles. Modulation. Speech input circuits. Western Electric, RCA, Bendix aircraft and ground station transmitters.

Receivers: Types, design, performance. Reception theory. Detection. Automatic volume control. National, Western Electric, RCA, Bendix receivers. Beacon receiver filters; Antennas.

Direction Finders: Principles. Aircraft radio compass. Indicators. B.A.C., Dieckman and Hell, Cathode-ray types. Simon radio guide. Kruesi, Lear, RCA, Western Electric, R.F.L. compasses.

Instrument Landing Systems: Basic types. Army developments. Bureau of Standards, Air-Track, Lorenz, Internatl. Telephone Development Co. systems. Bendix equipment.

Radio Traffic Control: Specifications for airport traffic-control receiver; for transmitter. Traffic control procedure.

Installation of Equipment: Bonding. Shielding. Antennas. Wiring. Installing power supply, transmitters, receivers.

Maintenance: Inspection. Maintenance of generators, transmitters, receivers. Trouble-shooting. Servicing.

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